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BONDARTZEV (A. S.). О распростанении домовых грибов в Ленинграде за последние годы (1940–1946). [On the spread of house fungi in Leningrad during recent years (1940–1946).]—*Природа* [*Nature*], 11, pp. 37–42, 1 col. pl., 5 figs., 1948.

The effects of the war and the blockade contributed to a considerable increase of house fungi [*R.A.M.*, 8, p. 3; 26, p. 572] in Leningrad. Analyses of numerous wood samples made during 1940–6 showed that the most common and destructive were the following: *Coniophora cerebella* [*C. puteana*], *Merulius domesticus* [*M. lacrymans*: ibid., 7, p. 292] (which was particularly widespread during the blockade), *Poria vaporaria*, *Paxillus panuoides*, *Poria vaillantii*, *P. xantha*, and *Trametes serialis*. The death-watch beetle (*Anobium* sp.) was observed most frequently in wood attacked by *C. puteana*.

WARING (E. J.), WILSON (R. D.), & SHIRLOW (N. S.). **Whiptail of Cauliflower. Control by the use of ammonium molybdate and sodium molybdate.**—*Agric. Gaz. N.S.W.*, 59, 12, pp. 625–630, 6 figs., 1948; 60, 1, pp. 21–26, 1949.

These articles deal with experiments and observations carried out in 1947 and 1948 in the central coast area of New South Wales, using ammonium and sodium molybdate for the control of cauliflower 'whiptail' [*R.A.M.*, 28, p. 263]. The results of the 1947 experiments have already been noted [ibid., 27, p. 400].

The disease is aggravated by soil acidity, heavy applications of nitrogenous fertilizers, such as ammonium sulphate, and poor soil aeration. Early maturing varieties such as Snowball, Nugget, and Hawkesbury Solid White are usually more liable to be affected than later maturing varieties. Seed produced on land liable to induce whiptail is more likely to give affected plants than seed grown on whiptail-free soil.

At Hawkesbury Agricultural College in 1948 three pH levels were provided by sulphur at 500 lb. per acre, no amendments, and dolomite at 2 tons per acre. Solutions containing 0, ½, 1, 2, and 4 lb. sodium molybdate per acre were applied to the plants in the field one week after transplanting. Out of a total of 2,304 plants, 63 were slightly affected by whiptail, 62 of which had not received sodium molybdate. At the end of the experiment the three pH levels were 5·2, 5·6, and 6·7, respectively.

At Cornwallis, Windsor, sodium molybdate was applied to six rows at ½, 1, and 2 lb. per acre, two rows being left untreated. Ammonium sulphate was applied to half the plants at 160 lb. per acre and to the other half at 480 lb. per acre. Fifty-nine of the 91 plants not receiving sodium molybdate developed whiptail, while none of the 286 treated plants were affected. In plots receiving the higher rate of ammonium sulphate the number of affected plants was greater and the symptoms appeared much earlier and were more severe.

The second article includes descriptions of the effects of field and seed-bed applications of molybdenum compounds by growers and at the Hawkesbury Agricultural

College. These experiments indicated that the easiest method of control is to water the plants in the seed-bed with the molybdate solution, one or two weeks before transplanting, at the rate of 1 oz. pure ammonium molybdate or 3 oz. crude (43 per cent.) sodium molybdate in about 10 gals. water per 10 sq. yds. of seed-bed. For field applications after transplanting it is recommended that 1 lb. ammonium molybdate or 3 lb. crude (43 per cent.) sodium molybdate be applied to each acre. The most effective method of securing a quick intake of the material is to apply a solution to the base of each plant; it may be found easier, however, to mix the material with an ordinary fertilizer and apply it as a side dressing.

Snyder (W. C.) & Bardin (R.). **Occurrence of Fusarium wilt in a market-garden crop of Radishes.**—*Plant Dis. Reptr*, 33, 1, p. 9, 1949. [Mimeographed.]

In July, 1948, a market-garden planting of Early Scarlet radishes in Monterey County, California, suffered up to 100 per cent. loss from wilt due to *Fusarium oxysporum* f. *raphani* [*R.A.M.*, 22, p. 160], apparently the first time the disease has been recorded for a crop grown for the roots. Soil inoculations made in the greenhouse with a spore suspension of the fungus caused typical symptoms in Early Scarlet radishes in about three weeks.

Sugar Beet yellows and the Mangold crop.—*J. Minist. Agric.*, 55, 10, pp. 450–452, 1949.

Sugar beet and mangold crops in Great Britain suffer serious losses from the yellows virus disease [*R.A.M.*, 26, pp. 39, 520], which reduces the yields by a half when the crop is infected in early August. Later infection causes correspondingly smaller losses.

In the spring of 1947 an extensive survey of mangold clamps (one of the most important overwintering sources of the infection) showed that severe aphid infestation [loc. cit.] was present throughout the country, with the exception of the north of England and Scotland. The degree of infestation increased during April.

It is recommended that the clamps should be used up by early April and the site cleared and ploughed. If, however, it is necessary to keep them longer, special clamps of roots from which all leaves have been removed should be made. Careful removal of all leaves and shoots is important at harvest time. Clamps should be made at a safe distance from fields which are to be cropped with mangold or beet. It has been suggested that if affected mangolds cannot be fed to stock quickly in April, the shoots should be trimmed off by hand and burned, together with the straw covering, and the roots stored in a barn.

In addition to red beet clamps [loc. cit.] other minor sources of infection, which should be kept as clean as possible, are wild beet, ground-keeping beet and mangolds (a serious problem only after difficult harvests), and garden crops of seakale beet, spinach beet, and winter spinach, which are favourable for the overwintering of *Myzus persicae* and are important sources of infection in urban areas, especially in the south of England.

McWhorter (F. P.). **Susceptibility of selections of Perfection Peas to strains of yellow Bean mosaic.**—*Plant Dis. Reptr*, 33, 3, pp. 139–144, 1949. [Mimeographed.]

Inoculations at the Oregon Agricultural Experiment Station of Perfection pea plants with strains of bean yellow mosaic (bean virus 2) [*R.A.M.*, 27, p. 105] showed that some selections were not uniformly resistant. None of the western strains of the virus caused infection, but it would be unwise to conclude that Perfection peas are resistant to all strains.

Vaughan (E. K.) & Dana (B. F.). **Experimental applications of dusts and sprays to Beans for control of Sclerotinia sclerotiorum.**—*Plant Dis. Reptr*, 33, 1, pp. 12–15, 1949. [Mimeographed.]

In an experiment carried out at Corvallis, Oregon, in 1948, Regular Blue Lake pole beans [*Phaseolus vulgaris*], to each plot of which sclerotia of *Sclerotinia sclerotiorum* [cf. *R.A.M.*, 23, p. 206; 24, p. 130; 25, p. 592, *et passim*] with active apothecia had been added when the plants were 24 in. high, were treated with six sprays and three dusts applied after weekly overhead irrigations. Of the sprays, parzate allowed (per 30 ft. row) 23·25 aerial infections and 29 basal with 22·75 plants killed (mean numbers), the corresponding figures for phygon being 27·25, 37, and 35·25, for bioquin 12·75, 15, and 11·25, for bismuth subsalicylate 2·25, 1·5, and 3·5, for zerlate 9·75, 10·75, and 7·75, and for silver nitrate 25, 27·5, and 27·25. The corresponding figures for the dusts were copper-sulphur 10·75, 10·25, and 13·75, phygon 14·5, 24, and 28·5, and parzate 25·5, 35·5, and 29, those for the untreated being 20·25, 21, and 24·5.

That the control of basal infections was roughly parallel to that of aerial infections indicates that most of the infections occurring low down are due to germinating ascospores, or to mycelium growing superficially on the outside of the stems and not to mycelium growing internally.

The number of plants in each plot girdled at or near the base was also roughly parallel to the number of aerial plus basal infections and indicated that total infections are a reasonably accurate measure of the losses sustained and the degree of control obtained.

In a similar test at Eugene, Oregon, in which, however, no inoculations were carried out, kolodust, parzate dust, phygon dust, and bioquin dust allowed, respectively, 2, 28, 7·67, and 11 total centres of infection (aerial and basal) per 30 ft. row, as compared with 33·67 for the untreated.

Delle Coste (A. C.), Offermann (A. M.), & Zabala (S.). **Determinación de los virus del Haba en cultivos de los alrededores de la ciudad de Buenos Aires.** [Determination of the Broad Bean virus in plantings in the environs of the city of Buenos Aires.]—*Rev. Invest. agric., B. Aires*, 2, 2, pp. 81–88, 2 col. pl., 1948.

A virus disease of broad beans observed of recent years in the vicinity of Buenos Aires falls into two types, of which the more common corresponds in symptomatology with 'broad bean mosaic', caused by *Pisum* virus 1 [pea enation mosaic virus: cf. *R.A.M.*, 19, p. 561] and the other with 'sweet pea streak' [? a strain of bean yellow mosaic virus] according to Ainsworth's classification [loc. cit.]. The only apparent difference in the former case is that the virus is transmissible to beans (*Phaseolus vulgaris*) and white clover (*Trifolium repens*), which are not included in the relevant literature among its potential hosts, and that it failed to infect any of the seven varieties tested of the reputedly susceptible soy-bean. Only one bean variety, Saint-Fiacre, proved susceptible to the pea enation mosaic virus. In the case of sweet pea streak, three of the seven varieties of the supposedly immune bean were attacked, whereas white clover, reported by previous workers as susceptible, withstood infection.

These differences are regarded as very slight and may be attributable either to variations within the viruses or to the use of genetically divergent plants for the transmission experiments. As regards the latter possibility, however, it is emphasized that the varieties used were for the most part identical with those selected by workers in other countries.

Furse (G. E.). **Winter Beans in Somerset, 1940–47. The chocolate spot disease problem.**—*J. nat. agric. adv. Serv.*, 1, 3, pp. 140–143, 1949.

From 1942 onwards broad bean crops in Somerset, England, suffered serious

losses from chocolate spot [*Botrytis cinerea* and *B. fabae*: *R.A.M.*, 26, p. 476; 27, p. 462], the disease being especially destructive in 1946, resulting in a considerable reduction of acreage. It is recommended to apply farmyard manure dressings in addition to phosphates; a light seeding of 2 to 2½ bush. per acre and wider spacings of 26 to 28 in. are advised. Spring beans (tick, spring, and mazagan) gave no consistently better results than winter beans [cf. ibid., 23, p. 467].

Sempio (C.). **Terzo contributo alla conoscenza dell' azione esercitata da vari fattori ambientali su alcune malattie parassitarie di piante coltivate (Peronospora della Lattuga).** [Third contribution to the knowledge of the action exerted by various environmental factors on some parasitic diseases of cultivated plants (*Peronospora* of Lettuce).]—Reprinted from *Riv. Biol.*, 34, 31 pp., 6 figs., 9 graphs, 1942. [Received March, 1949.]

Further experiments, on the same lines as those previously described [*R.A.M.*, 18, p. 48; 19, p. 381], on the effects of various environmental conditions on lettuce infection by *Bremia lactucae* [ibid., 27, p. 108] during the three main phases of infection [one to three, four to seven, and seven to ten days after inoculation] showed that the host is most susceptible during the third phase to the effects of most of the environmental factors tested (temperature, humidity, darkness, light rays, carbon dioxide, oxygen, ultra-violet rays, and atmospheric pressure). The results confirmed the view previously expressed that this phase in the cycle of infection is a highly critical one, during which the host-parasite complex is unable to resist and overcome unfavourable environmental conditions.

Wilson (R. D.). **Some responses of Lettuce to the application of molybdenum.**—*J. Aust. Inst. agric. Sci.*, 14, 4, pp. 180–187, 2 figs., 1948.

A crop of lettuces grown on acid soil (pH about 5·1) at Wetherill Park, New South Wales, exhibited yellowing and stunting of the leaves accompanied by marginal scorching of, and a high content of oxidizing materials in, the older leaves. Applications of sodium molybdate at 0·07 and 0·09 gm. per plant [*R.A.M.*, 26, p. 93] and ammonium molybdate at 0·0095 to 0·25 gm. per plant resulted within 26 to 43 days in better growth and darker green foliage, compared with untreated plants, and a reduction in the amount of oxidizing materials. Leaf tests indicated an improvement in this direction 13 to 30 days before definite visible responses were observed. In leaves of apparently healthy plants the molybdenum treatments caused less reduction in the amount of oxidizing materials than in the unthrifty plants. No evidence was obtained to indicate that the higher rates of application were more effective than the lowest; no toxic effects were observed. These results demonstrate not only a field response to molybdenum by lettuce but also that in this plant it acts as a reduction catalyst.

Du Toit (J. J.). **Powdery mildew or 'white rust' on Cucurbits.**—*Fmg S. Afr.*, 23, 273, pp. 815–816, 1948.

Cucurbit crops in the western and south-western Cape Province, South Africa, suffer considerable annual losses from powdery mildew [*Erysiphe cichoracearum*: *R.A.M.*, 27, p. 343]. Experiments carried out during three successive seasons clearly demonstrated that sulphur dusting gave a more effective control than treatments with copper-containing fungicides, but minimum quantities should be applied, preferably with a machine giving a fine cloud, as most of the plants are sensitive to sulphur injury. The first dusting should commence as soon as the first symptoms appear and be repeated eight days later, and again after two, two to three, and three weeks.

Smith (P. G.). **Powdery mildew resistance in Cucumber.**—*Phytopathology*, 38, 12, pp. 1027–1028, 1 fig., 1948.

Powdery mildew of cucumbers (*Erysiphe cichoracearum*) is generally of minor economic importance, but occasionally it necessitates control measures in California and elsewhere. No reference to a systematic search for resistance to the disease could be found in the relevant literature. In 1940 seed of Puerto Rico No. 37 was received from the Puerto Rico Agricultural Experiment Station for trial observation. Plants of this variety and Abundance were grown in the greenhouse at Davis, California, the following winter, during which infection arose from natural sources. Abundance contracted the disease in a severe form, whereas Puerto Rico No. 37 showed a mere trace of mildew. Crosses were made between the two varieties. In the winter of 1942–3 a small population of F_1 and F_2 plants were inoculated in the greenhouse and rated for degree of infection, about the time of fruit set, by a method similar to Pryor and Whitaker's [*R.A.M.*, 22, p. 193], in which 0 = disease-free and 4 = severely diseased.

Two of the three plants of Puerto Rico No. 37 were free from infection and one was slightly diseased. Three of the F_1 hybrids gave a 3 reaction and six were severely diseased. Of the F_2, five plants were rated as 1, 38 as 2, 39 as 3, and 28 as 4. The three plants of the susceptible Snow's Perfection, used as checks, were severely diseased. The susceptibility of the F_1 hybrids and the range of reaction in the F_2 indicate that resistance is a result of multiple factors and is incomplete. The resistance of the five F_2 plants rated as 1 approximated to that of the resistant parent.

Barger (W. R.), Wiant (J. S.), Pentzer (W. T.), Ryall (A. L.), & Dewey (D. H.). **A comparison of fungicidal treatments for the control of decay in California Cantaloupes.**—*Phytopathology*, 38, 12, pp. 1019–1024, 1948.

The authors describe and tabulate the results of their comparative studies on fungicidal treatments for the control of decay in cantaloupes [*R.A.M.*, 17, p. 154], comprising storage tests at Fresno, California, shipping tests from Fresno or the vicinity to New York City, and laboratory tests with nitrogen trichloride at New York City. The Powdery Mildew Resistant No. 45 variety was used in all the trials. After treatment the melons in the storage tests were held at temperatures of 50° or upwards to 70° F. for periods up to 14 days to promote the growth of the rotting fungi. Chief among these were two strains of *Rhizopus* [? *R. stolonifer*] and *Cladosporium* [*cucumerinum*] (the principal agent of decay at the lower temperatures) [loc. cit.].

The three most promising treatments were sodium borate and sodium hypochlorite washes and nitrogen trichloride fumigation. For instance, in 1943 a two-minute dip in 2·5 per cent. borax wash at 100° reduced the incidence of decay from 91 per cent. to nil in melons stored for 14 days between 14th and 30th September, with slow cooling from 70° to 55°, while in another lot held for 14 days between 1st and 18th October a ½-minute dip in the same solution at 110° also completely eliminated infection, which amounted to 80 per cent. in the controls. In 1944 perfect control was again obtained in a six-day storage test at 65° between 8th and 17th August by two minutes' immersion in 5 per cent. borax wash at 100°. Next in order of efficiency came merthiolate [ibid., 26, pp. 148, 161] (1 in 20,000) and sodium hypochlorite (1 per cent.) washes, with a two-minute dip in each case. The former, however, cannot be recommended since the food authorities object to its mercury content. Lauryl dimethyl benzyl ammonium chloride gave reasonably good results in a ten-day storage test (17th to 27th September, 1946) at 50° (two minutes in a 1 in 1,000 wash), but the attitude of the authorities towards this compound is unknown. Nitrogen trichloride, used at concentrations of 11, 15, 17, and 25 mg.

per cu. ft. for periods of four, five, or six hours, gave fairly consistent reduction of decay, but tolerance tests by Klotz's method [ibid., 15, p. 576] on cultures and viable spores of cantaloupe pathogens indicated that complete destruction by fumigation cannot be expected. The treatment of entire car-lots of cantaloupes with nitrogen trichloride is practised commercially by several California shippers, the gas being introduced from generators into refrigerator cars soon after the completion of loading. Fumigation is continued for about five hours, and air circulation within the car is provided by a fan.

Miller (L. I.). **Cultural and parasitic races of Cercospora arachidicola and Cercospora personata.**—Abs. in *Phytopathology*, 39, 1, p. 15, 1949.

Cultural races of *Cercospora arachidicola* and *C. personata*, differing in colour and growth rate and type, were isolated from diseased groundnut [*R.A.M.*, 28, p. 53] leaves from various parts of the United States in 1946 and 1947. Monosporous lines from the divergent races have remained very stable in culture. Field and greenhouse inoculation experiments in 1948 on different groundnut varieties revealed significant disparities in pathogenicity between several of the cultural races of both species. Blackish leaf lesions with sharp margins are characteristic of one biotype of *C. arachidicola* on Spanish variety No. 146, while the same variety, inoculated with another race of this species, develops light brown lesions with a small, yellow border.

Wahl (I.). **Mutants of Agaricus campestris induced by uranium salts.**—Abs. in *Phytopathology*, 39, 1, pp. 24–25, 1949.

Further details are given of the variants induced in the cream-brown type of *Agaricus* [*Psalliota*] *campestris* by the addition to the potato dextrose agar medium of 0·1 to 1 gm. per l. uranium nitrate [*R.A.M.*, 28, p. 233]. One mutant was white, flocculent, and grew rapidly, producing a mycelial mat weighing five to seven times as much as that of the controls on the same substratum plus sodium nitrate. The characters of the variant remained generally constant in subcultures on the latter medium. The fruit bodies of this mutant were also white, and a tendency to yield mushrooms earlier than the parental type was also apparent in preliminary trials. Basidiospores of the white mushroom germinated readily and gave rise to a flocculent mycelial culture. White fruit bodies were also produced by the second variant developing under the influence of uranium nitrate, the colonies of which were flat, pinkish, and distinctly zonate. Similar cultural mutants were induced by uranyl sulphate and uranium acetate.

Edwards (R. L.). **Mushroom research station at Yaxley.**—*Nature, Lond.*, 163, 4139, p. 337, 1949.

Since a group of British growers set up their own mushroom [*Psalliota* spp.] research station at Yaxley in 1945, six experimental crops have been grown there and the main requirements for making a productive synthetic compost from wheat straw have been determined [cf. *R.A.M.*, 25, p. 248; 26, p. 189; 27, p. 61]. In small-scale tests on a commercial farm this compost has given a yield comparable with the best obtained from horse manure.

The source of nitrogen has been ascertained to be very important, organic nitrogen giving higher yields than the inorganic forms so far tested. An empirical mixture of 12 trace elements had a pronounced effect. In preliminary experiments with growth substances the number of mushrooms produced has been increased in several experiments, and earlier fruiting has been secured.

Variations in the depths of the beds and in the intervals at which spawn is sown exercised marked effects on time of fruiting and on yield. On several occasions the

factors affecting the number of mushrooms produced were distinguished from those affecting size; this work may throw light on the conditions affecting appearance of mushrooms in flushes, the opening of the veil, and the exhaustion of mushroom beds.

TASCHENBERG (E. F.). **Hooded booms for Grape spraying.**—*Bull. N.Y. St. agric. Exp. Sta.* 732, 34 pp., 19 figs., 1948.

To reduce the effect of wind while spraying grape vines, four types of hood have been developed since 1940 to envelop the vines temporarily. These are the rigid, hinged, collapsible, and adjustable types, the construction of which is fully described and the advantages and disadvantages of each discussed. Detailed instructions are also given for the construction of improved spray units.

PIROVANO (A.). **Le soufre activé.** [Activated sulphur.]—*Vitic. Arboric., Paris*, 94, 10, pp. 296–297, 1 graph, 1948.

A new physical method of activating sulphur has been developed which, with the aid of the sun, confers a toxicity for all the Erysiphaceae and for vine *Oidium* [*Uncinula necator*: *R.A.M.*, 27, pp. 310, 553] in particular. The maximum chemical activity of sulphur secured by a degree of heat that induces a powerful emission of its vapour can be attained at the surface limit of the sulphur particles when they are pigmented with black and exposed in full sunlight on the green organs of plants [cf. ibid., 26, p. 228]. It is important that the pigmentation should not be superficial, thus shading the particles, but incorporated within them. The pigmentation process is now perfected. Samples of activated sulphur (which appeared ebony black in colour *en masse* and dark grey after pulverization and ventilation) attained after exposure to light 11·25 to 11·27 times the vaporizing power of unpigmented samples similarly exposed. The ventilation of the natural environment greatly reduces the above value but the results prove that it is still considerable.

For nine years a section of the vines of the Institut de l'Arboriculture de Rome at Grottarossa was given a single application of activated sulphur when the shoots were 20 to 25 cm. long, and although during the first few years the yield was far from perfect, no more infection with *U. necator* has since been seen on the grapes, leaves, or shoots.

Dusting with crude mineral sulphur containing 29 per cent. sulphur obtained from grey gangue (pearl grey after ventilation) gave results at least equal to those with 98 per cent. yellow sulphur.

The results are given below of comparative experiments carried out in 1946 on the Maccarese plains using badly infected Carignan vines (1 ha. for each product). With five dust applications of mineral sulphur (29 per cent. sulphur) using 130 kg. of the product, 8·89 per cent. of the bunches were infected at harvest time, the total cost being 8·350 lire; with four sprays of 2 per cent. sulphobentonite T (42 kg. of the product), 16·87 per cent. of the bunches were infected, the cost 8·200 lire; four sprays with 2 per cent. copper sulphobentonite (42 kg. of the product), 10·6 per cent. infected bunches, cost 8·400 lire; two applications of powdered activated sulphur (30 kg. of the product), 1·82 per cent. infected bunches, cost 3·500 lire; two sprays with a mixture of activated sulphur and 0·3 per cent. copper acetate (30 kg. sulphur), 0·16 per cent. infected bunches, cost 4·100 lire (but dispensing with two treatments with Bordeaux mixture); two sprays with activated sulphur (as above) plus Casale's mixture (30 kg. sulphur), 0·21 per cent. infected bunches, cost 3·900 lire (economizing as above). Shoots completely invaded at the time of the opening of the buds in the lots treated with activated sulphur yielded small bunches which were perfectly healthy. Up to June no leaf scorching was observed.

A single dust application of activated sulphur completely checked *Sphaerotheca*

pannosa on roses and various Erysiphaceae on peas [*Erysiphe polygoni*] and pumpkins [*E. cichoracearum*].

Borzini (G.) & Pirovano (A.). **La Peronospora della Vite e l'oidio. Nuove esperienze pratiche da lotta.** [*Peronospora* and *Oidium* of the Vine. New practical experiments in control.]—Reprinted from *Ital. agric.*, *1947*, 8 pp., 4 figs., 1947. [Received January, 1949.]

In the experiments herein described for the control of vine downy mildew (*Plasmopara viticola*) on the Moscato di Terracino variety in central Italy [cf. *R.A.M.*, 28, p. 3], the results obtained by spraying with various cuprammoniacal mixtures, e.g., fungicide M and R.P. 12 Montecatini (16 and 12 per cent. copper, respectively), and cuprammina 1946 Rumianca (12·5 per cent. copper), organic copper preparations with the addition of other salts, such as ramital [Casale's mixture] (12·5 per cent. copper), and a copper oxide (copper Sandoz) compared favourably with those of Bordeaux and Caffaro's mixtures, used as controls. The differences between the various products, however, were insufficient to permit of grading them in respect of practical efficiency.

In the tests against *Uncinula necator* on Carignano vines the best control was given by two applications of 2 per cent. ramsolfo (copper-sulphur), closely followed by Casale's mixture with 2 per cent. activated sulphur.

Branas (J.). **Recherches sur la dégénérescence infectieuse de la Vigne.** [Studies on infectious degeneration of the Vine.]—*Progr. agric. vitic.*, 130, 40–41, pp. 180–188, 6 figs., 1948.

This is a slightly amplified account of information already noted from other sources [*R.A.M.*, 28, pp. 2, 207].

Nelson (K. E.), Hewitt (W. B.), & Break (R. A.). **Arsenite spray injury to Grape canes through leaf scars.**—*Phytopathology*, 39, 1, pp. 71–76, 2 figs., 1949.

Sodium arsenite (containing an equivalent of 2¼ lb. arsenic trioxide per 100 gals. water), applied during the dormant season to the canes, arms, and trunks of Thompson Seedless vines on dry soil plots in California for black measles [*R.A.M.*, 19, p. 25] control, caused appreciable injury in the form of sharply defined, necrotic areas in the xylem tissue below the leaf scar and also bud-killing. Where only the arms and trunks were sprayed the damage was considerably less, and was confined to the lower nodes of the canes. Treated vines in a wet soil showed only minor xylem injury with little bud-killing.

Histological study revealed little or no wound gum in the open vessels of the leaf traces in scars collected in December after leaf fall. However, in about 70 per cent. of the January collections some of the leaf trace vessels were plugged, in 20 per cent. all were occluded, and only in 10 per cent. were the vessels practically free from gum. By February the occlusion of the leaf trace vessels was complete.

The sodium arsenite solution was found to penetrate to the xylem tissue through the leaf trace vessels, the resultant necrosis extending as far as 4 in. below the leaf scar as well as upwards into the bud.

Smith (K. M.). **Viruses.**—*Brit. Sci. News*, 2, 16, pp. 112–115, 3 figs., 1949.

The author briefly discusses the insect transmission of turnip yellow mosaic virus [*R.A.M.*, 26, p. 38; 28, p. 261] in relation to the anatomy of the insect and describes some of the chemical features of this virus. He gives brief notes on photographing viruses with the electron microscope and on polyhedral virus diseases of insects.

Kelly (Sally M.) & Black (L. M.). **The origin, development and cell structure of a virus tumour in plants.**—*Amer. J. Bot.*, 36, 1, pp. 65–73, 10 figs., 4 diags., 1949.

Histological investigations at Brooklyn Botanic Garden of tumours produced in the roots of *Melilotus alba* seedlings by inoculation with the wound tumour virus [clover big vein virus: *R.A.M.*, 27, p. 24] by means of infective leaf hoppers (*Agallia constricta* and *Agalliopsis novella*), and mature tumours from the roots of 13 species representing ten different plant families showed that, in all species, abnormal cell multiplication rather than cell enlargement was responsible for tumour growth.

Schmidt (Trude). **Das Auftreten wichtiger Krankheiten und Schädlinge an Kulturpflanzen in Österreich im Jahre 1948.** [The occurrence of important diseases and pests on cultivated plants in Austria in the year 1948.]—*PflSch. Ber., Wien*, 3, 3–4, pp. 48–54, 1 graph, 1949.

The following items in this report may be mentioned. Non-parasitic disorders occurring in Austria during 1948 included a more or less defective development of hazel nut [*Corylus avellana*] shells, which in places were only of the thickness of paper besides showing cracks and holes. The extraordinarily low summer temperatures are believed to have caused the trouble. Another widespread source of complaint was vine chlorosis [*R.A.M.*, 24, p. 112].

Potato blight (*Phytophthora infestans*) was much in evidence in the western districts after several years' absence, and a heavy outbreak of powdery scab (*Spongospora subterranea*) occurred in the Tyrol.

Wheat bunt (*Tilletia tritici*) [*T. caries*] was particularly virulent in the wooded regions and Upper Austria, while *T. secalis* was reported on rye [ibid., 19, p. 12] from the Tyrol and Tamsweg.

Virus diseases of potato are assuming constantly increasing importance. Tomato fern leaf [cucumber mosaic virus: ibid., 18, p. 811] was very frequently encountered and stem rot (*Didymella lycopersici*) also occurred.

Report of the Federal Experiment Station in Puerto Rico 1948.—27 pp., 1949.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, 28, p. 118]. H. F. Winters states that in the additional plantings of *Cinchona* made at Toro Negro during the past two years, the survival rate ranged from 7·1 to 86·6 per cent. and was apparently correlated with resistance to *Phytophthora* disease, the chief cause of loss. A strain of *C. ledgeriana* designated Maricao No. 24 was less affected by the fungus than most of the other selections.

H. R. Cibes and N. F. Childers found that about 20 per cent. of the vanilla crop in an experimental planting was attacked by blast (*P. jatrophae* [*P. parasitica*: ibid., 10, p. 755]) and had to be discarded. Both vines and fruit are involved. The leaves and stems gradually wither and die and the beans become unmarketable. Breeding experiments are in progress with crosses between the high-grade commercial *Vanilla fragrans*, which is very susceptible to root rot (*Fusarium batatatis* var. *vanillae*) [ibid., 27, p. 464], and the inferior but resistant *V. phaeantha*.

Twenty-second Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1947–1948.—38 pp., 1948.

In this report [cf. *R.A.M.*, 27, p. 115] it is stated that cold storage studies showed that Cox's Orange apples from trees given phosphate and potash as well as nitrogen developed less breakdown and fungal infection [unspecified] but more scald and pit than apples from trees given nitrogen only. With Jonathan apples, increasing amounts of nitrogen reduced storage quality, as did the absence of potash. Nitrogen

unbalanced by phosphate and potash greatly reduced the storage quality of Sturmer apples, but the complete-treated fruit was as good as the untreated controls.

Brown rot [*Sclerotinia fructicola*] on Golden Queen peaches was satisfactorily controlled by phygon, applied 21 and seven days before picking [ibid., 27, p. 573]. Bordeaux mixture (1–2–100 or 3–6–100) gave good control of plum bacterial spot [*Xanthomonas pruni*: ibid., 27, p. 116], but caused foliage injury. Mercurated lead arsenate was the only therapeutant that appeared likely to check apple black spot [*Venturia inaequalis*: ibid., 27, p. 117] without plant injury. Pear stony pit [ibid., 27, p. 555] was found to be graft-transmissible.

When standard wheat varieties were grown in soil infected with eye spot [*Cercosporella herpotrichoides*: ibid., 24, p. 493] Cross 7 was most susceptible (91 per cent. infection) and Tuscan least (75 per cent.). Of 190 samples of 1947 harvest grain from throughout the wheat-growing area examined for covered smut [bunt: *Tilletia caries* and *T. foetida*] 156 showed no bunt present.

Using onions as a test crop, studies were carried out on the copper-deficient peat land north of Christchurch [cf. ibid., 27, p. 517]. Two foliar sprays of copper sulphate at 20 lb. per acre gave excellent results. The *Aspergillus* method for evaluating available copper was found satisfactory, and showed the available copper in the sand and silt loam of the farm lands of North Auckland to be very low.

During the year research on *Phormium tenax* was concentrated on yellow leaf [ibid., 26, p. 231] which is making serious inroads into both natural and artificial stands on the Moutoa Estate. The cause of the condition has not yet been ascertained, but trace-element deficiencies do not appear to be involved.

In spraying and dusting trials against rye-grass [*Lolium perenne*] blind seed disease [*Phialea temulenta*: ibid., 27, pp. 284, 478] Bordeaux mixture gave the best results, followed (in descending order of merit) by dithane, phygon dust, phygon solution, and fixtan.

ESFANDIARI (E.). **Les maladies des plantes cultivées et des arbres fruitiers des régions subtropicales du nord de l'Iran.** [The diseases of cultivated plants and fruit trees in the subtropical regions of northern Iran.]—*Ent. Phytopath. appl., Tehran, 1947*, 5, 21 pp., 14 figs., 1947. [Persian, with French summary on pp. 1–7. Received June, 1949.]

Some of the records included in this briefly annotated list of diseases of fruit trees and cultivated crops observed during a trip along the shores of the Caspian Sea in June and July, 1947, have already been noticed [*R.A.M.*, 21, p. 99; 26, p. 356; 27, p. 227; and below, p. 387]. Among the remainder are scab (*Fusicladium pirinum*) [*Venturia pirina*] and *Monilia* [*Sclerotinia*] *fructigena* on pear (the latter also on quince); *Podosphaera leucotricha* and *Nectria galligena* on apple (the latter also occasionally on pear); *Tranzschelia* [*Puccinia*] *pruni-spinosae*, *Clasterosporium carpophilum*, and *Polystigma rubrum* on prune [ibid., 27, p. 26] and apricot; *Puccinia pruni-persicae* [ibid., 15, pp. 236, 609], often in association with *P. pruni-spinosae*, and *Taphrina deformans* on peach; *Plasmopara viticola* and *Cercospora vitis* [ibid., 17, p. 726; 24, pp. 388, 442] on vine; *Pseudomonas* [*Xanthomonas*] *juglandis* on walnut; *Colletotrichum gloeosporioides* on citrus; *Fusarium juruanum* [*Calonectria diploa*: ibid., 18, p. 504] and *Cephalosporium lecanii* [ibid., 25, p. 262] parasitizing coccids pathogenic to citrus, the latter fungus causing up to 100 per cent. mortality; *Bacterium* [*Pseudomonas*] *tabacum*, *Bact. angulatum* [*P. angulata*], *Pythium debaryanum*, and *Thielavia basicola* [? *Thielaviopsis basicola*: ibid., 27, p. 298] on tobacco (the two last-named reported by the Director of the Tobacco Experiment Station at Tirtache); *Cercospora hibisci* [ibid., 24, p. 388] on *Hibiscus cannabinus*; *Melampsora lini* on flax (including the wild species *Linum album* and *L. nodiflorum*); *Sphacelotheca holci-sorghi* [*S. reiliana*] on sorghum; *Colletotrichum camelliae* [*Glomerella cingulata*] on tea [ibid., 17, p. 71]; *Cercospora beticola* and

Uromyces betae on beet (fodder varieties only); *U. appendiculatus* on bean [*Phaseolus vulgaris*]; *Septoria petroselini* on parsley; *Colletotrichum lagenarium* on watermelon, and mildew (?) *Sphaerotheca fuliginea* [ibid., 27, p. 78] on all kinds of Cucurbitaceae.

Annual Report of the Massachusetts Agricultural Experiment Station for the fiscal year ending 30th June, 1948. (Bulletin 449.)—80 pp., 3 figs., 1948.

In the botanical section of this report [*R.A.M.*, 28, p. 6] M. A. McKenzie, A. V. Osmun, and D. H. Marsden state that up to 8th July, 1948, Dutch elm disease (*Ceratostomella ulmi*) had been isolated from 1422 trees on the mainland of Massachusetts.

W. L. Doran states that in further work on the effects of fungicides applied as powder-dips to cuttings of woody plants immediately after treatment with a root-inducing substance the following were found non-injurious: spergon to Canada hemlock [*Tsuga canadensis*], *Genista pilosa*, and *Juniperus squamata meyeri*; phygon to the first two; morpholine thiuram disulphide to Carolina hemlock [*T. caroliniana*]; zinc ethylene bis-dithiocarbamate to red cedar [*Thuja plicata*]; and a zinc dimethyl dithiocarbamate-cyclohexamine to Chinese juniper [*Juniperus chinensis*].

In work on the control of soil-borne diseases, in which different fungicides were applied to the soil in a carrier of commercial fertilizer (usually 5–8–7, 15·6 gm. per sq. ft.) the following results were obtained with pre- and post-emergence damping-off [*Rhizoctonia* spp., including *Corticium solani*, and *Pythium* spp.] of cabbages. The numbers of living seedlings (as compared with untreated soil) were increased 633 per cent. by phygon (0·65 gm. per sq. ft.), and 377 per cent. in one instance and 889 per cent. in another by tuads (0·65 gm.) [ibid., 27, p. 213]. Increase in weight of cabbage seedlings was 86 per cent. with phygon and 50 per cent. with tuads. The numbers of tomato seedlings which lived were increased 281 per cent. by tuads and 246 per cent. by phygon (each 0·65 gm.), increase in average green weight of the seedlings being 183 and 233 per cent., respectively. Tuads (0·65 gm.) gave 35 per cent. increase in living beet seedlings and 82 per cent. in living lettuce seedlings. Tuads, phygon, and fermate completely prevented onion smut (*Urocystis cepulae*) though the controls in untreated soil showed over 50 per cent. infection. Tuads and phygon gave better control of damping-off of onions than fermate, both treatments giving more than 1,000 per cent. increase in surviving plants over the controls. Phygon, however, occasionally retarded the growth of the seedlings, and tuads or arasan is probably preferable. When 50 per cent. of the onion seedlings in untreated soil were infected with smut, there was no smut in the soil treated with arasan (0·6 gm.), and as a result also of good control of damping-off the numbers of living plants were greater by over 2,000 per cent.

Organic fungicides gave some protection against cabbage club root (*Plasmodiophora brassicae*) [loc. cit.] when it was not too severe in untreated soil. When 100 per cent. club root was present in untreated soil, there was also 100 per cent. infection in soil to which hydrated lime (20 gm.) had been applied and in soil to which mercurous chloride (0·2 gm.) but no lime had been applied. When, however, hydrated lime (20 gm.) and mercurous chloride (0·2 gm.) were applied together to this soil, only 13 per cent. club root developed, the degree of infection was slight, and the average green weight of the plants was 128 per cent. greater than in untreated soil. Mercurous chloride (0·2 gm.) or mercuric chloride (0·1 gm.) retarded early growth of cabbage when applied to unlimed soil immediately before seeding, but not when applied to limed soil, or to soil 22 days before seeding. In soil watered daily to 50, 65, and 80 per cent. of its water-holding capacity, there was 100 per cent. club root in the wettest soil 36 days after sowing, 56 per cent. in the 65 per cent. saturated, and 10 per cent. in the driest; there was no club root at any soil-moisture content in soil treated with both hydrated lime (20 gm.) and mercurous chloride (0·2 gm.).

In further work by L. H. Jones on tobacco frenching [ibid., 28, p. 7] a compost soil was divided into four fractions for treatment by autoclaving, air-drying, or formaldehyde, one portion remaining untreated as control. Soil temperatures of 95° F. (high) and 70° (low) were used. No frenching occurred on a compost soil at 70° or 95°. Neither air-drying, freezing, nor formaldehyde treatment prevented frenching [loc. cit.]. Chemical analysis indicated a relationship between the iron content of the plants and frenching. The iron content was much lower in plants grown at a soil temperature of 95°, which frenched, than in plants grown at a soil temperature of 70°, which did not french. When the soil was autoclaved before the plants were set, no frenching occurred at 95°, and the iron content of the plants was even higher than that of plants in autoclaved soil at 70°. The addition of a ferrous sulphate-peat mixture prevented frenching and gave the plants a very high iron content, though when the iron was supplied from the less available iron of ferric phosphate mixed with peat, frenching was not prevented by moderate amounts and the iron content of the plants was not increased, whereas the heaviest application tested did prevent frenching, and the iron content of the plants was higher.

The early symptom of frenching, pinhead mottling, when induced by high soil temperature, was almost indistinguishable by ordinary observation from pinhead mottling induced by nitrogen deficiency. Both causes produce chlorotic, narrow even filiform leaves, while rosetting also occurs. Frenching from high soil-temperature is usually obtainable in 20 days, and has been obtained in five, whereas the shortest time in which pinhead mottling was obtained from a nitrogen-deficient soil was 38 days.

The view that want of available iron causes the type of frenching induced by high soil-temperature was further supported by a greenhouse experiment in which application of iron sulphate and peat followed by heavy watering caused chlorotic rose plants to recover.

E. F. Guba states that the Improved Bay State tomato variety is resistant, wherever grown, to all forms of *Cladosporium fulvum* [ibid., 28, p. 7]. In a test of the resistance of 200 types of tomatoes to *Phytophthora infestans* [ibid., 26, pp. 136, 176] promising immune types were found, and are being grown for further study.

A field of squash was sprayed during summer, and in addition the fruits were immersed in fungicides after harvest and examined periodically. Black rot (*Mycosphaerella citrullina*) [ibid., 26, p. 379] was exceptionally destructive on the Butternut and Hubbard squashes. Exceptionally warm weather up to December was an important factor contributing to losses in storage. In the field fermate, parzate, and zerlate gave, respectively, 3·2, 2·8, and 1·7 per cent. infection, as against 31 per cent. in the unsprayed controls. The successful control of the disease on Butternut in storage requires protective spraying in the field. Painting the stem end with phygon or zerlate greatly reduced stem end infection, especially on sprayed plants.

In investigations on fungicides for use on apples both phygon and flotation sulphur paste gave excellent control of scab [*Venturia inaequalis*: ibid., 28, p. 7]. Phygon caused a serious foliage chlorosis, which appeared to be corrected by adding twice the quantity of Epsom salts. Scab eradication in 1948 was outstanding with phenyl mercury acetate (fungicide no. H.L. 381, California Spray Chemical Corporation), phenyl mercury monoethanol ammonium acetate (puratized B), and phenyl mercury formamide (puratized 806) (Gallowhur Chemical Corporation). The striking effect of these upon visible and incubating scab suggests that satisfactory control is possible even with a belated and curtailed spray schedule.

Botany.—*Rep. Ga Exp. Sta., 1947–8*, pp. 62–68, 1 fig. [? 1948].

The following items are of phytopathological interest in this report [cf. *R.A.M.*, 28, p. 53]. Continuing their experiments on the control of the three major diseases

of muscadine grapes [*Vitis rotundifolia*] in Georgia [*Melanconium fuligineum*, *Guignardia bidwellii*, and *Mycosphaerella angulata*: loc. cit.], E. S. Luttrell and M. M. Murphy applied Bordeaux mixture (4–4–50) as follows: (1) not sprayed; (2) three sprays prior to blooming; (3) three sprays on the green berries; (4) two sprays on the ripening berries; and (5) complete schedule, which gave an increase of 27 lb. of fruit over the check group (1); each group of sprays contributed to this increase.

B. B. Higgins states that several tomato × *Lycopersicon pimpinellifolium* back cross progeny were entirely free from wilt (*Fusarium oxysporum* f. *lycopersici*) [*F. bulbigenum* var. *lycopersici*] and stem canker (*Macrosporium* [*Alternaria*] *solani*) [ibid., 28, p. 36].

In groundnut investigations B. B. Higgins, W. K. Bailey, and Naomi C. Woodroof report that a selection of North Carolina Runner, named Selection 56–15, has proved significantly superior to commercial strains in yielding ability and appears to be quite resistant to concealed damage [ibid., 27, p. 170]. A selection (67–14) from a small seeded strain of Virginia Bunch has yielded well wherever it was planted in Georgia.

According to J. L. Weimer brown spot (*Ceratophorum setosum*) [ibid., 27, p. 525] caused serious damage to some lupin fields during the rainy winter months. Small dark spots were produced on all above-ground parts of the plants. Under favourable conditions adjacent spots may coalesce until considerable areas of the leaves and even the stems are killed. The young cotyledons, first leaves and young stems may be badly spotted or killed and late in the season flowers, pods, and seeds may be infected. Yellow [*Lupinus luteus*] and white [*L. albus*] lupins are more susceptible than blue ones.

Anthracnose (*Glomerella cingulata*) [ibid., 27, p. 367; 28, p. 18] is most active on blue lupins during the warmer months of early autumn and late spring when large stem cankers are formed, pods are attacked, and the seeds decay. In some of the less severely injured seeds the fungus survives the cleaning and drying process and may initiate infection in the field the next autumn. For the present, rotation and the use of disease-free seed appear to be the most practical means of controlling anthracnose and brown spot.

Starr (M. P.). **The nutrition of phytopathogenic bacteria. III. The Gram-positive phytopathogenic Corynebacterium species.**—*J. Bact.*, 57, 2, pp. 253–258, 1949.

In further studies on phytopathogenic bacteria [cf. *R.A.M.*, 25, p. 545; 28, p. 273] carried out at the University of California, the minimal nutritive requirements of six species of Gram-positive phytopathogenic *Corynebacterium* were determined under carefully controlled conditions. None of the species grow on the basic medium of ammonium chloride, glucose, and salts alone; *C. fascians* required the addition of thiamine; *C. flaccumfaciens* and *C. poinsettiae* of amino acids, biotin, pantothenate, and thiamine; and *C. insidiosum*, *C. michiganense*, and *C. sepedonicum* of amino acids, biotin, nicotinic acid, and thiamine. The addition of yeast extract to the basic medium plus a casein-vitamin mixture moderately stimulated the growth of some strains of *C. insidiosum* and *C. sepedonicum*.

Braun (A. C.). **Recent advances in the physiology of tumor formation in the crown-gall disease of plants.**—*Growth*, 11, 4, pp. 325–337, 2 figs., 1947.

This is a review, based on a lecture read at the annual Symposium of the Society for the Study of Development and Growth, held at Storrs, Connecticut, 26th to 29th August, 1947, of recent progress in the understanding of the process of tumour formation in crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*) [see next abstracts]. The survey is confined, for the most part, to work carried out at the Rockefeller

Institute for Medical Research, Princeton, New Jersey. Most of the 14 papers cited in the bibliography have been noticed in this *Review*.

Braun (A. C.) & Mandle (R. J.). **Studies on the inactivation of the tumor-inducing principle in crown gall.**—*Growth*, 12, pp. 255–269, 2 figs., 1948.

Normal cells of *Kalanchoe daigremontiana* were transformed into tumour cells by crown gall bacteria (*Agrobacterium* [*Bacterium*] *tumefaciens*) [*R.A.M.*, 21, p. 247; 27, p. 119] at 25° but not at 32° C. Once the cellular transformation has been accomplished, however, the tumour cells develop into a neoplastic growth at both temperatures. The minimum period required for the conversion of normal into neoplastic cells by the bacteria is 32 ± 2 hours at 25°. This could be reduced, however, to ten hours by the interpolation of a 24-hour incubation period at 32° following inoculation. Most of the plants were no longer susceptible five days after wounding.

A comparison of histological data and plant inoculation studies indicated that the transformation of normal into tumour cells is most liable to occur before or during the initial stages of active wound-healing. It was further shown that the inactivation of the tumour-inducing principle itself takes place at 32°, this process occupying about the same length of time as its production by the bacteria at 25°. As a result of this finding a semi-quantitative method was developed whereby it was made possible to predict, within the limits of biological experimentation, not only whether tumours would be initiated under a given set of experimental conditions, but if they were produced, their relative size could be estimated beforehand with reasonable accuracy. The relative dimensions of the neoplasms seem to depend on the amount of transforming principle available at the time of the cellular alteration.

Segrétain (G.). **Rôle de la plaie d'inoculation dans le développement des tumeurs à Agrobacterium tumefaciens.** [Role of the inoculation wound in the development of tumours due to *Agrobacterium tumefaciens*.]—*C. R. Acad. Sci., Paris*, 228, 18, pp. 1452–1453, 1949.

As already demonstrated by Braun in connexion with *Kalanchoe daigremontiana* [see preceding abstract], the exposure of *Pelargonium zonale* and the P-19 tobacco variety, inoculated with the tomato isolate 42/4 of *Agrobacterium* [*Bacterium*] *tumefaciens* [see next abstracts], for five days to a temperature of 31° to 33° C. inhibited the formation of tumours when the plants were subsequently transferred to 20°. The bacteria in samples removed from the sites of inoculation five days after the operation were fully alive both in the plants held at a normal temperature and those exposed to heat. Tumours developed at the site of removal of the samples, even in the plants of the latter series. On *P. zonale* normal tumours were formed when the plants, after five days' exposure to heat, were simply pricked with a sterile needle above and below and on the right and left of the original inoculation wound, or when incisions were made above and below it with a sterile scalpel. On tobacco this procedure results in the formation of a tumour which develops faster and attains a larger size than those on the control plants.

Likewise in agreement with Braun, it was found that the minimum period at normal temperature requisite for the initial development of tumours in *P. zonale* corresponds to the process of cicatrization of the wound. On the other hand, masses of bacteria are readily discernible, especially in the intercellular spaces of the medulla and in the woody vessels, up to a distance of about 1 cm. on either side of the site of inoculation. Thus, it seems possible that substances secreted by the plants at the time of cicatrization, and inactivated under the influence of heat, play a part in tumour formation.

Rybak (B.). **Une nouvelle méthode en microbiologie végétale. Premiers résultats avec Phytomonas tumefaciens.** [A new method in plant microbiology. First results with *Phytomonas tumefaciens*.]—*Ann. Inst. Pasteur*, 73, 10, pp. 1015–1023, 2 figs., 1947.

Strain 42/4 of *Phytomonas* [*Bacterium*] *tumefaciens*, grown on a medium consisting of agar and an extract from the galls on *Pelargonium zonale* (20 gm. of the former per l. of the latter), produced at 27° or 35° C. 'involution' forms characterized by mucous, transparent colonies. Similar results were obtained on a medium with a base of healthy *P. zonale* tissues by the addition of glucose, maltose, or saccharose at 30 gm. per l. Vitamin B_1 exerted a favourable effect on the growth of 42/4. The mucous forms were more virulent in inoculation experiments than the smooth parent colonies.

Rybak (B.). **Conditions et nature de la transformation muqueuse de Phytomonas (Bacterium) tumefaciens.** [Conditions and nature of the mucous transformation of *Phytomonas* (*Bacterium*) *tumefaciens*.]—*C. R. Acad. Sci., Paris*, 228, 13, pp. 1171–1172, 1949.

The reconversion of the mucous forms of strain 42/4 of *Bacterium tumefaciens* produced on a medium of crown gall extract and agar [see preceding abstracts] into the original smooth colonies was readily effected on a bouillon-agar substratum at 37° C. A polysaccharide isolated from the mucous forms is believed to be identical with the glucosan extracted by McIntire *et al.* from strain A 6 [*R.A.M.*, 21, p. 409].

Stapp (C.). **Haltbarkeits- bzw. Lebensdauerversuche mit Reinkulturen vorwiegend pflanzenpathogener Bakterien.** [Stability or longevity experiments with pure cultures of predominantly phytopathogenic bacteria.]—*Phytopath. Z.*, 15, 1, pp. 79–87, 1948.

Experiments were undertaken to ascertain whether non-sporing, predominantly phytopathogenic bacteria could retain their viability if subcultures were made at considerably longer intervals than is customary, with a view to economy of material and labour. The experiments covered a period of 2½ to 5 years and were carried out by nine different methods. The first four series were subdivided into two groups, one comprising two- and the other seven-day old cultures. The phytopathogenic species or strains numbered 21 and the nodule bacteria six.

The best results were obtained in the series in which the cultures were immersed in sterile liquid paraffin after seven days' incubation, 15 (roughly 56 per cent.) of the total of 27 being viable at the end of five years, while the corresponding number for those incubated for only two days prior to immersion in paraffin was nine (33 per cent.). The 15 organisms in the seven-day series included *Bacterium amylovorum* [*Erwinia amylovora*], *Bact. phytophthorum* [*E. phytophthora*: see below, p. 384], *Bact.* [*Corynebacterium*] *rathayi*, *Pseudomonas lacrymans*, *P.* [*Xanthomonas*] *malvacearum*, *P. pisi*, *P.* [*Bact.*] *rhizogenes*, *P. tabacum*, and two strains of *P.* [*Bact.*] *tumefaciens*. *P. intybi* also remained viable for five years in one of the two lots of seven-day cultures. The maximum number of cultures surviving the full experimental period when melted into test-tubes after incubation was ten. After 2½ years a maximum of 11 cultures held over calcium chloride in the desiccator without aeration, and ten treated in the same way with aeration were still viable. One of the survivors in the unaerated calcium chloride series was *P. savastanoi* (one lot, two days' incubation), while all lots of *P. syringae* similarly treated with aeration retained their viability for 2½ years. The other methods tested were less successful, and evidently none of the procedures employed can be relied upon to maintain non-sporing bacteria in a viable state over lengthy periods.

Coleman (Madeline F.) & Reid (J. J.). **The conversion of strains of Alcaligenes radiobacter and Phytomonas tumefaciens in the 'S' phase to the 'M' phase of the heterologous species.**—*Phytopathology*, 39, 3, pp. 182–190, 1949.

In further studies on the serological relationship between *Alcaligenes* [*Bacterium*] *radiobacter* and *Phytomonas* [*Bact.*] *tumefaciens* [*R.A.M.*, 24, p. 271], conversion *in vitro* of the latter into the former was effected by placing the *Bact. radiobacter* capsule on the *Bact. tumefaciens* 'S' phase cell. Difficulty was experienced in *in vitro* attempts at the conversion of *Bact. radiobacter* into *Bact. tumefaciens*, but the process was accomplished *in vivo* by the inoculation of an appropriate host in the form of six-week-old tomato plants, using the methods of Hendrickson *et al.* [ibid., 14, p. 289], with 'S' strains of *Bact. radiobacter*. The conversion of *Bact. tumefaciens* to a form serologically identical with *Bact. radiobacter* in the 'M' phase was accompanied by loss of pathogenicity to tomato. However, the virulence of the former organism was restored by the removal of the *Bact. radiobacter* 'M' capsule, and in the inoculated tomato plants it induced the formation of a capsule of the *Bact. tumefaciens* serological type. The results of the study indicate that the two organisms comprise a single species and in their 'M' phases bear the same relation to each other as do the types of pneumococcus [*Diplococcus pneumoniae*] to one another.

Stapp (C.). **Bakterielle Erkrankungen der Kautschukpflanze Taraxacum koksaghis.** [Bacterial diseases of the india-rubber plant *Taraxacum kok-saghyz*.]—*Phytopath. Z.*, 15, 1, pp. 73–78, 1948.

From the roots of *Taraxacum kok-saghyz* affected by a wet rot in a German plantation bacteria were isolated which proved to be pathogenic in inoculation experiments both to their own host and to potato tubers and hence are to be regarded as the agents of the disease. On the basis of their morphological, cultural, physiological, and serological characters they are referred to the ninth subgroup of the *Bacterium phytophthorum* [*Erwinia phytophthora*] group, i.e., they are in complete serological agreement with the causal organism of a wet rot of swedes in Lower Silesia [*R.A.M.*, 25, p. 285].

Bonde proposes to unite all the bacteria concerned in potato black leg and seed piece decay under the name of *E. carotovora* in preference to *E. phytophthora* [ibid., 19, p. 113], whereas Dowson wishes to separate the two species on biochemical grounds [ibid., 20, p. 541], which the author finds insufficient for purposes of classification. All the agents of wet rot should be designated by one name, either *E. carotovora* or *E. phytophthora* [ibid., 28, p. 354], preferably the latter [ibid., 8, p. 397], and further subgroups added or the existing ones widened for the admission of new representatives as occasion arises.

Thomas (R. C.). **The bacteriophage reaction for the identification of bacteria.**—*Tech. Bull. Ohio agric. Exp. Sta.* 11, 12 pp., 2 figs., 1948.

While biochemical and physiological procedures have been used in the identification of bacteria, the most satisfactory results have been obtained from specific serum. A simpler method would, however, be widely welcomed and the bacteriophage reaction offers great promise in this direction, [cf. *R.A.M.*, 27, p. 413; 28, p. 57]. Phage reactions are as striking and definite as agglutination and precipitin reactions and bacteriophages are remarkably specific.

To prepare a phage, 100 gm. oats are washed several times with distilled water, soaked in distilled water, and kept at 18° C. for 24 hours or placed in a refrigerator for two or three days. After extraction, the brown liquid is removed by filtering. The quality of the extract for phage production is improved by freezing and reducing the liquid to about one-half its volume. The extract may also be rendered more active by dialyzing against distilled water until the colour has been removed.

After the oat extract has been prepared, it is filtered through a sterile porcelain candle to remove bacteria. Any liquid medium is satisfactory for developing a phage provided the organism for which a phage is desired grows well in it. Three tubes, each containing 8 ml. nutrient solution, are inoculated each with three drops from an 18- to 24-hour-old bacterial culture. The first tube is the control. To the second and third tubes the filtered oat extract is added in quantities of three drops to the second and one ml. to the third. The cultures are then incubated at optimum growth temperature. After 18 to 20 hours, the control tube should show normal growth, while the others should be completely clear or only slightly clouded. If clouded, the liquid should be filtered to remove bacteria and a new series of tubes started, using the filtrate from the first series, but reducing the amount of filtrate added to the second and third tubes to three and seven drops. In the development of a phage specific for a culture at least six series of cultures should be made, to remove by dilution the uncombined, non-specific phage-precursor of the original extract, otherwise a false reaction may result when the filtrate is used to identify an unknown isolate. If complete lysis is attained in the first or second passage, filtering before beginning another series is unnecessary.

If one plant or grain extract does not contain a phage-precursor [ibid., 19, p. 653] which will give a phage showing complete lysis of an organism, extracts of other grains or seeds should be tried. Nutrient broth is a satisfactory medium for most plant pathogens. After a phage has been developed for a known organism, new isolates of the same organism may be identified by testing against a phage for that species.

In employing the phage reaction for the identification of unknown isolates the author uses a set of three tubes for each culture to be determined. All tubes are inoculated alike from an 18- to 24-hour-old culture. One tube is kept as a control, and to the second and third one and three drops of phage filtrate are added. The cultures are then placed in an incubator at optimum growth temperature. Usually, after five to ten hours, a positive phage reaction becomes evident, as shown by the normal clouding of the control tube and complete absence of growth in the tubes containing phage filtrate. Isolates which show the same degree of lysis as the known culture used for comparison may be regarded as identical with it. The lytic reaction is of value only with pure cultures.

Bacteriophages may be stored in brown glass bottles of 30 ml. capacity, with bakelite screw caps. These are sterilized in a hot-air oven, then filled with filtrate from a phage-treated culture and stored at 8°. Such filtrates were found fully active after six years' storage. Another method is to use hermetically sealed glass ampoules which may be stored in the dark at room temperature. A phage filtrated for one strain of *Bacterium* [*Xanthomonas*] *stewarti* placed in a sealed tube showed no loss of lytic activity after 12 years.

Ciferri (R.). **Estudios sobre Cacao. I. Incidencia de la 'pasmazón de los pepinos' en algunos Cacaos venezolanos. II. Incidencia de los infecciones sistémicas y extemporáneos del Phytophthora palmivora sobre mazorcas de Cacaos forasteros y criollos de Venezuela.** [Studies on Cacao. I. Incidence of wilt of the 'cucumbers' in some Venezuelan Cacaos. II. Incidence of systemic and casual infections of *Phytophthora palmivora* on the pods of foreign and native Cacaos of Venezuela.]—*Rev. Fac. Agron. Medellín*, 8, 32, pp. 395–413, 1948.

The writer's studies on wilt of the 'cucumbers' (small pods) of cacao were carried out at the Cacao Experimental Centre in the State of Aragua, Venezuela, from the beginning of November, 1947, to the end of June, 1948. The disease, which is of physiological origin, has previously been reported from Trinidad [*R.A.M.*, 22, p. 293]. Its intensity reaches a maximum when the pods attain a length of 5 cm., but those up to 10 cm. may also be affected. The shrivelled fruits cling to the tree for several weeks. The average age of the trees at the Centre is 50 years or upwards

and shade trees are provided. Of the total cacao population, 41 per cent. is unproductive, while of the remainder 14, 26, and 60 per cent. are of high, medium, and low productivity, respectively. Of the trees comprised in this survey, 19 were foreign Venezuelan (a subpopulation derived from crossing Trinidad with native material), six native white (or discoloured) and nine purple types. The total incidence of wilt was '74·7' per cent., distributed among the three groups in proportions of 76·4, 82·5, and 87·1 per cent., respectively. The susceptibility to wilt among individual trees ranged from 65 to 100 per cent. in the foreign Venezuelan group, 72 to 100 in the native white, and 79 to 100 in the purple types. No correlation could be established between the morphological characters of the pods and their liability to wilt.

Observations on the incidence of infection by *Phytophthora palmivora* on the pods of 218 foreign Venezuelan, 79 native white, and 18 purple types covered the period from the beginning of December, 1947 to the end of August, 1948. In agreement with Dade [ibid., 11, p. 702], the author differentiates between the basal infections originating in the peduncle and the apical and lateral proceeding from external sources. The percentages of rotted pods in the foreign Venezuelan, native white, and purple groups were 16·7, 8·9, and 15·9, respectively, of which 72·1, 61·9, and 81·9 per cent., respectively, were basal. Subdividing the foreign Venezuelan group into three classes according to the surface of the pod—rough, intermediate, and almost or quite smooth—the percentages of infection were 36·6, 17, and 12, respectively. During the dry period, March, April, and May, the percentages of rotted pods in the foreign Venezuelan, white, and purple groups were 29·4, 56·5, and 50, the corresponding figures for the wet months (June to August) being 70·6, 43·5, and 50, respectively. The percentages of basal infections in the three groups were 90·7, 88·9, and 75, respectively, in the dry spell and 68·2, 42·9, and 25 in the wet. The period of maximum susceptibility to basal infection begins when the pods attain a length of more than 9 to 10 cm., corresponding to an age of 75 to 90 days, and closes with their maturity, 140 to 150 days from the fertilization of the flower. There is, however, also an early phase of infection, occurring when the pods are about a fortnight old, i.e., during the period of maximum intensity of the physiological wilt referred to above. It is exclusively basal and may involve up to a fifth part of the pods hanging from diseased peduncles.

Ciferri (R.). **Symptomatology of virus diseases induced in Cacao by '2–4, D' treatment.**—*Nature, Lond.*, 163, 4153, p. 881, 1949.

During treatment with commercial '2–4, D' emulsions for weed control in Venezuela, the basal shoots of small blocks of cacao showed distortion and malformation followed by shedding of the young leaves. A few scattered leaves developing from buds were wrinkled, curled, hardened and rugose or smooth, and ruffled. The leaves were frequently narrower than usual, mottled or chlorotic and vein-banded or with red veins while others remained normal. The next new flush of foliage was healthy.

The symptomatology is that of one or two or even more virus diseases of cacao as described in Trinidad [*R.A.M.*, 23, p. 379; *Trop. Agriculture, Trin.*, 21, 7, pp. 130–132, 1944], the Dominican Republic [*R.A.M.*, 9, p. 631], and Colombia [ibid., 28, p. 9]. The same effect induced by treatments with '2–4, D' has been observed on vines in Italy by Baldacci and Topi (in the press) with symptoms resembling those of 'court-noué' or 'roncet'.

Lansade (M.). **La désinfection des semences de céréales.** [Cereal seed disinfection.] —11 pp., Paris, L'Association Générale des Productions de Blé et Autres Céréales, 1948.

Short practical notes are given on the symptoms, importance, and control by

seed treatment of the chief seed-borne cereal diseases in France [cf. *R.A.M.*, 27, pp. 358, 517; 28, p. 121].

ESFANDIARI (E.). **Les charbons des céréales en Iran.** [Cereal smuts in Iran.]—*Ent. Phytopath. appl., Tehran, 1948*, 6–7, 20 pp., 7 figs., 1948. [Persian, with French summary on pp. 18–21.]

Smuts are responsible for heavy losses (average 25 to 30 per cent.) in the cereal crops of Persia. Bunt (*Tilletia tritici* [*T. caries*] and *T. foetens* [*T. foetida*]) and loose smut (*Ustilago tritici*) are ubiquitous. Effective control of the former disease may be obtained by dusting with graminon [*R.A.M.*, 26, p. 11] or the Russian product AB [ibid., 19, p. 391], while Luthra's solar heat method [ibid., 21, p. 69] is recommended against the latter. Flag smut of wheat (*Tuburcinia* [*Urocystis*] *tritici*) was first observed in Persia in 1940 at Karadj, where over 20 per cent. of the plants in a small field were infected. The disease was again detected in 1947 at Varamine, causing 5 to 15 per cent. infection. The pathogen is believed to have been introduced into the country with consignments of cereal seed-grain from India and Australia received during and even before the war of 1939–45.

The loose and covered smuts of barley (*Ustilago nuda* and *U. hordei*) cause only insignificant damage.

During the war large quantities of sorghum seed were imported from India with a view to the extension of the crop. The seed, however, proved to be heavily contaminated with *Sphacelotheca sorghi*, epidemics of which broke out with such intensity as virtually to preclude further cultivation.

Millet (*Setaria italica*) smut (*U. crameri*) [ibid., 24, p. 187] may reduce the crop by up to 50 per cent. in the mountainous regions of the north. Seed disinfection with 4 per cent. formalin should be practised.

HAFIZ (A.). **Smut diseases and their control by cultural methods.**—*Sci. J. R. Coll. Sci.*, 18, pp. 77–80, 1948.

Following an outline of the economic importance of the smut diseases of cultivated plants (principally cereals) and the types of infection, the author discusses their control by adjustments in soil temperature and moisture, and changes in the technique and time of sowing, with special reference to flag smut of wheat [*Urocystis tritici*: *R.A.M.*, 28, p. 79]. For instance, at Lyallpur, Pakistan, the incidence of this disease may be reduced to a minimum merely by sowing in October a fortnight before the normal time, when the soil temperature is over 28° C., whereas 70 to 80 per cent. infection may be expected to develop in stands sown during the third week of November at 18°. Experiments in the Punjab have further shown that a heavy reduction in the amount of flag smut may be effected by sowing in wet soil with moisture contents of 70 per cent. saturation and upwards, or by the prompt application of water (up to 24 hours after sowing) to dry soil.

PAL (B. P.) & HASANAIN (S. Z.). **A study of the relation of certain morphological and functional characters to the stem rust resistance of Wheat varieties.**—*Indian J. agric. Sci.*, 16, 5, pp. 459–468, 4 graphs, 1947. [Received April, 1949.]

During 1939–40 and 1940–1 an investigation was carried out to determine, under the conditions prevailing in the Simla hills, to what extent the relative proportions and disposition of sclerenchyma and collenchyma, and also differences in the time, duration, and amount of opening of stomata might be able to account for the varying degrees of field resistance to stem [black] rust (*Puccinia graminis*) [*R.A.M.*, 11, pp. 439, 440, 562] in 16 wheat varieties belonging to the species *Triticum vulgare*,

T. durum, *T. dicoccum*, *T. monococcum*, highly resistant, moderately resistant, or highly susceptible in their reaction to the disease.

No correlation was established between the characters studied and the rust reactions of the different varieties. It is concluded, therefore, that none of them furnishes an index for facilitating the breeding of rust-resistant strains of wheat.

WAGNER (F.). **Über das Auftreten von Zwergsteinbrand in Bayern.** [On the occurrence of dwarf bunt in Bavaria.]—*Pflanzenschutz*, 1, 1, pp. 1–2, 2 figs., 1948.

The available information on dwarf bunt of wheat ([a form of] *Tilletia tritici*) [*T. caries*: *R.A.M.*, 27, p. 12] is summarized in connexion with the discovery of the disease in Upper Bavaria and Swabia.

TAYLOR (J. W.), RODENHISER (H. A.), & BAYLES (B. B.). **Physiologic races of Erysiphe graminis tritici in the southeastern United States.** —*Agron. J.* (formerly *J. Amer. Soc. Agron.*), 41, 3, pp. 134–135, 1949.

At the present time wheat powdery mildew (*Erysiphe graminis tritici*) is a major disease of winter crops in the south-eastern United States, where physiologic races of the fungus, hitherto absent or uncommon in that region, have developed of recent years and are spreading from south to north. In 1944 one of these races attacked the previously resistant Hardired in South Carolina, in the following year the same variety was heavily infected in North Carolina, and by 1946 the pathogen had reached Beltsville, Maryland. While tests with the Hardired race were in progress, a second one was collected in January, 1948, on the previously resistant Axminster and hybrid selections carrying the Axminster resistance factor. This second race also affected Hardired. Greenhouse trials were then carried out at Beltsville with the two new races and one isolated from Purplestraw, which has been prevalent in the south-east for many years, on the four differential varieties used by Mains in the United States [*R.A.M.*, 13, p. 431] and by Newton and Cherewick in Canada [ibid., 26, p. 386], namely, Axminster, Chul, Huron, and Norka, several varieties that had shown some degree of resistance to one or more races of *E.g. tritici* in preliminary tests, and the susceptible checks, Leap and Purplestraw. Axminster, Chul, and Norka proved resistant to the Hardired race, while Huron R.L. 20 was susceptible. There are similarities in pathogenicity between this race and Newton and Cherewick's race 4 and Mains's race 1, but certain discrepancies require elucidation before a definite classification can be made. The Axminster race resembles the Canadian 5, but here again the reactions of Hope present a difficulty, the latter variety being resistant to the latter race and susceptible to the former. A number of the experimental varieties possess factors for resistance to all three races, including the spring wheats Chul, Converse, Indian, Sturgeon, and *Triticum timopheevi*, and Michigan Amber selection, while Trumbull-Red Wonder × Steinwedel–*T. timopheevi* is resistant to the Hardired and Purplestraw strains and moderately so to the Axminster.

HONECKER (L.). **Die wichtigsten Blattflecken-Krankheiten der Gerste, ihre Bedeutung und die Möglichkeiten ihrer Bekämpfung.** [The principal leaf spot diseases of Barley, their importance, and the possibilities of their control.]—*Prakt. Bl. PflBau*, 21, 1, pp. 1–19, 4 figs., 1943–44. [Received June, 1949.]

This is a useful summary of the available information on the life-histories, symptomatology, economic importance, and control of the pathogens responsible for the four principal leaf spots of barley in Germany, namely, *Helminthosporium gramineum*, *H. teres*, *H. sativum* [*R.A.M.*, 14, p. 299], and *Marssonina graminicola* [*Rhynchosporium secalis*: ibid., 8, pp. 302, 639].

Ross (J. G.), Semeniuk (W.), Taylor (D. K.), & Jenkins (B. C.). **Factors affecting the degree of infection of Barley by loose smut (Ustilago nuda (Jens.) Rostr.)**—*Sci. Agric.*, 28, 11, pp. 481–492, 1 graph, 1949.

Studies on loose smut of barley (*Ustilago nuda*) [*R.A.M.*, 27, p. 316] conducted at the University of Alberta since 1936, in which the variety Newal (C.A.N. 1089) and hybrids from a cross between Trebi and Glabron were most commonly used, showed that the most successful method of inoculation was to inject an aqueous suspension of chlamydospores into the floret [cf. ibid., 26, p. 101] during the period between dehiscence of pollen and early stages of fertilization. When the florets were inoculated with dry chlamydospores, moist weather conditions were required to induce infection. Increased infection occurred when inoculation was followed by days having relative humidities and precipitation above the average. If moisture conditions were favourable, higher infection was obtained on warmer days. By raising the humidity artificially to near saturation infection was increased when inoculations were made with dry chlamydospores, but was less when suspensions were used.

The most resistant varieties were Trebi and Titan, closely followed by Warrior. Glabron, Velvon, Wisconsin Pedigree No. 38, Regal, O.A.C. 21, and Mensury showed a slight degree of resistance while Newal, Sanalta, Olli, Colsess, and Montcalm, among others, were susceptible to loose smut. The reaction of seven smooth-awned selections from a cross between Trebi and Glabron varied from extreme susceptibility to apparent immunity.

The degree of adherence of lemma and palea after flowering was concluded to have little effect on degree of infection.

Wells (S. A.) & Platt (A. W.). **The effect of loose smut on the viability of artificially inoculated Barley seeds.**—*Sci. Agric.*, 29, 1, pp. 48–52, 1949.

At the Dominion Experimental Station, Saskatoon, during 1944 barley plants of the varieties Plush, Conway, Tregal, and Regal were treated as follows: (*a*) florally inoculated with chlamydospores of *Ustilago nuda* [see preceding abstract] by means of a hypodermic needle, (*b*) inoculated with tap water (*c*) the lemmas punctured with a needle, and (*d*) untreated. The emergence of the seeds from plants in group (*a*) was much lower than in the other three groups.

In three other tests in which 400 seeds of each of 21 barley varieties were inoculated, it was found that the varieties with the best stands had the highest infection percentages at maturity. The embryos of inoculated seeds were sometimes almost completely destroyed by the invading mycelium. Some embryos were recovered after treatment with sodium hydroxide; those that were not recovered were presumed to have been destroyed by the fungus. A highly significant positive correlation of 0·769 was established between the percentage of embryos not destroyed and the percentage stand of comparable lots of seed.

The fact that the amount of infection present on a variety at maturity depends not only on inherent resistance, but also on the ability of the seed to germinate and grow when the embryo is infected should be considered when studying the genetics of loose smut resistance in barley.

Poehlman (J. M.). **Sources of resistance to loose smut, Ustilago nuda, in winter Barleys of foreign origin.**—*Agron. J.*, 41, 5, pp. 191–194, 1949.

The reactions of 165 foreign strains of winter barleys to inoculation with Missouri collections of loose smut (*Ustilago nuda*) [*R.A.M.*, 26, p. 389] from 1944 to 1948, inclusive, are tabulated and discussed. Of the 34 varieties classified as resistant (with an incidence of infection not exceeding 5 per cent.), 11 were from Chosen, six from the U.S.S.R., five from China, four each from the Caucasus and Trans-

caucasus, and one each from Holland, Persia, and Afghanistan, and one was of hybrid origin. In ten varieties there were no smutted heads and in a further five infection did not exceed 1 per cent.

Peturson (B.). **The occurrence of Puccinia coronata on Rhamnus frangula in Canada.**—*Phytopathology*, 39, 2, pp. 142–148, 1 fig., 1949.

The aecidial stage of *Puccinia coronata* var. *agrostis*, listed by Eriksson (*Ark. Bot.*, 8, pp. 1–26, 1909) and Klebahn (*Z. PflKrankh.*, 22, pp. 321–350, 1912) as one of the formae speciales of crown rust, has been collected on *Rhamnus frangula* [cf. *R.A.M.*, 22, p. 474] every year since 1939 at Fredericton, New Brunswick. In 1945, 1946, and 1947 the teleuto and uredo stages of the rust were collected on *Agrostis* spp. growing close to the diseased *R. frangula* bushes. In inoculation experiments *Agrostis hiemalis*, *A. tenuis*, *A. lacnantha*, *A. nebulosa*, and *A. rupestris* proved susceptible to *P. coronata* var. *agrostis*, *A. stolonifera* moderately susceptible, *Calamagrostis canadensis* and *C. arundinacea* moderately resistant, while 12 other grasses (including oats and four species of *Agrostis*) were immune. The aecidiospores, uredospores, and teleutospores of *P. coronata* var. *agrostis* measure 20·1 by 17·3, 21·2 by 19·5, and 40·8 by 16·8 μ, respectively, and thus agree closely with Fraser and Ledingham's *P. coronata* var. *bromii* [ibid., 12, p. 364], but are definitely smaller than those recorded by the same authors for *P. coronata* vars. *avenae* and *eleagni*. Up to the present aecidial infections of crown rust on *R. frangula* in North America have only been reported from Fredericton.

Litzenberger (S. C.). **Nature of susceptibility to Helminthosporium victoriae and resistance to Puccinia coronata in Oats.**—*Phytopathology*, 39, 4, pp. 300–318. 4 figs., 1 graph, 1949.

Helminthosporium victoriae in oatmeal agar cultures at the Iowa Agricultural Experiment Station [*R.A.M.*, 27, p. 181] produced a toxic substance [ibid., 27, p. 17] affecting oat plants at very low dilutions (0·5 per cent. and upwards). The susceptible Victoria variety rapidly developed chlorosis and necrosis, accompanied by wilting, the two first-named symptoms being specific to the susceptible genotypes; the resistant Bond showed only slight wilting when placed in more concentrated extracts. Transpiration was irreversibly reduced by the toxin both in resistant (Clinton) and susceptible (Tama) varieties. Plants infected by *H. victoriae* yielded toxins in sufficient concentrations to induce effects comparable to those secured with pure cultures.

Extracts from plants infected by *Puccinia coronata* exerted a similar influence on genotypes with a hypersensitive reaction, which were also damaged to a lesser extent by extracts from healthy plants. Apparently *P. coronata* secretes a toxin which reaches a sufficient concentration by the time of sporulation to induce localized necrosis.

It is suggested that susceptibility to *H. victoriae* and resistance to *P. coronata* depend on analogous types of reactions evoked by toxins. Host tissue destruction by these substances would facilitate the growth of a facultative saprophyte like *H. victoriae* while erecting a physiological barrier to an obligate parasite such as *P. coronata*. The hypothesis of a gene with a pleiotropic action is in agreement with the available genetical data.

Cunningham (J. C.). **Maize bibliography for the years 1888 to 1916, inclusive.**—*Contr. Ia Corn Res. Inst.*, 3, 2, pp. 67–189, 1948.

This is a bibliography of 3,549 scientific articles concerning maize cultivation published from 1888 to 1916, inclusive. The subjects are arranged alphabetically and include bacterial, virus, fungous, and physiological diseases under their com-

mon names, and each is followed by relevant citations in alphabetical order of authors.

WALLIN (J. R.). **A new method of inoculating the Maydeae with smut fungi.**—*Science*, 109, 2830, pp. 312–313, 1 fig., 1949.

A new method of inoculating maize seeds with *Ustilago zeae* [*U. maydis*] and other smuts consists in soaking them in sporidial suspensions. Entrance to the host was apparently gained through the germinating seed and eventually the fungus reached the crown of the seedling. Some of the seedlings were killed immediately after emergence, others developed large galls, while yet others were not attacked. In the experiments with *U. maydis* on Golden Bantam sweet corn, 100 seeds were infested, 82 plants emerged, and 32 were diseased, the corresponding figures for *U. dieteliana*, isolated from *Tripsacum latifolium* near Mexico City, being 260, 210, and 81, respectively. In the commercial hybrid U.S. 13 dent corn tests, 100 seeds were infested with *U. maydis*, 97 plants emerged, and only two were diseased, the corresponding figures for *U. dieteliana* being 420, 400, and 29, respectively. *U. maydis* failed to infect 40 teosinte [*Euchlaena mexicana*] seeds from Mexico, and of the 13 plants emerging from 20 seeds of the same host infested with *U. dieteliana*, only two became diseased.

The results of these experiments led to a search for smutted seedlings in field plots that had formerly grown maize. In the spring of 1946 infected seedlings 4 to 6 in. tall were found, and later they were also observed in adjoining fields. Most of them were killed before attaining a height of 8 in.

HOPPE (P. E.). **Differences in Pythium injury to Corn seedlings at high and low soil temperatures.**—*Phytopathology*, 39, 1, pp. 77–84, 3 figs., 1949.

Stunting in maize seedlings, without conspicuous lesions on the mesocotyls or roots, first observed in a greenhouse experiment at the Wisconsin Agricultural Experiment Station when untreated, nearly disease-free kernels with crown wounds were planted in warm (20° to 24° C.) compost soil, was demonstrated at this temperature following pure culture with a species of *Pythium* originating in a naturally infected seedling in warm soil. Two methods of inoculation were used, the sand culture and fungus mat. In the former, week-old cultures on 2 per cent. potato dextrose agar are kneaded by hand with autoclaved white sand. A 6-in. earthenware crock is about half-filled with compost soil, to which are successively added inch-deep layers of autoclaved sand, inoculated sand, in which the maize kernels are planted, and finally, either autoclaved sand or vermiculite. In the fungus mat method the kernels are planted between mycelial mats removed intact from the dishes.

Experiments were carried out by both methods on crown-wounded kernels from a mixture of two dent hybrids, untreated and arasan-dusted, grown at controlled warm (20° to 24°) and cold (11°) soil temperatures, with one series of controls in naturally infested compost soil and the other in a layer of sterile sand over compost. In the low temperature series the omission of treatment resulted in 100 per cent. pre-emergence killing of the seed inoculated by either of the above-mentioned methods, whereas at the high temperature a stand of 96 per cent. was obtained with sand culture inoculations and 86·7 with the fungus mat. In naturally infested compost, the figures were 0 and 98 per cent., respectively. Seeds dusted with arasan produced stands of 87 and 73·3 per cent. for the sand culture and fungus mat inoculations, respectively, and 90 per cent. for the compost in the low temperatures series, and 100, 93·3, and 98 per cent. in the warm series.

Both untreated and dusted seed gave rise to almost identical stands of mostly healthy seedlings when the kernels were planted in the uninoculated layer of autoclaved sand in the low temperature test. Evidently, therefore, the seed decay

resulting from inoculation and from sources of natural infection in the compost soil could not be attributed to seed-borne infections.

The principal effect of the high soil temperature on inoculated untreated seed, or on that planted in naturally infested compost soil, was a marked stunting involving about two-thirds of the seedlings. Arasan treatment of inoculated seed resulted in almost complete control at 20° to 24°, but 16·3 per cent. of the seedlings from treated seed planted in the compost soil at this temperature were stunted, due perhaps to the presence of more virulent strains of the fungus. Of the seedlings arising from kernels germinated in the layer of autoclaved sand, only 7 per cent. were stunted, probably as a result of infection by seed-borne pathogens. There seems to be no doubt that the main stunting effects in these experiments were caused by soil fungi. The benefits of seed treatment in warm soil do not appear to have been recognized hitherto.

Patel (M. K.). **Production of oospores by Sclerospora sorghi on Maize.**—*Curr. Sci.*, 18, 3, p. 83, 1949.

In February, 1940, stunted, etiolated Kashmir Sweet maize plants at the College of Agriculture, Poona, were found to be infected by a species of *Sclerospora*, the conidia, oospores, and other organs of which proved to be identical with those of *S. sorghi* [*R.A.M.*, 24, p. 443]. In cross-inoculation tests, moreover, *S. sorghi* from sorghum attacked Kashmir Sweet maize plants and vice versa. The only other species of *Sclerospora* hitherto reported to produce oospores on maize is *S. macrospora* [ibid., 22, p. 62]; its position within the genus, however, is regarded as doubtful [ibid., 20, p. 457].

Lefebvre (C. L.) & Sherwin (Helen S.). **An undescribed species of Helminthosporium on Sudan Grass and Sorghum.**—*Mycologia*, 40, 6, pp. 708–716, 2 figs., 1948.

In 1939 the authors received samples of Tift Sudan grass (common Sudan grass × Leoti sorghum hybrid) affected by a leaf spot, which caused defoliation among some breeding material. Later the causal organism, identified as a new species of *Helminthosporium* and named *H. sorghicola*, was found on several species of sorghum, mostly in the southern United States.

The well-defined, round to elliptical, tan spots vary in size from barely visible to up to 15 mm. by 1 to 6 mm. and may coalesce to involve the whole leaf. Older lesions usually show alternate light and darker bands of tissue, producing characteristic target or zonate patterns. Inoculations of common Sudan grass (which has never been found naturally infected) caused reddish-purple lesions.

Under field conditions the sporulation of the fungus is rather sparse, but was abundant in a moist chamber. Simple, occasionally branching, olivaceous brown conidiophores arise singly or in groups of two to four, measuring 115 to 700 by 5·5 to 10·5 μ. Secondary conidiophores, common under moist conditions, are shorter, 25 to 200 by 5 to 7 μ. Golden yellow to light olivaceous conidia, with two to eight septa on Tift Sudan grass measure 20 to 105 by 8·5 to 20·6 μ, are usually curved, widest near the middle, and tapering slightly towards rounded ends. The peripheral wall is thin, the inconspicuous hilum moderately broad, and germination is effected by two polar germ-tubes.

Klotz (L. J.), Boyce (A. M.), Chapman (H. D.), Carman (G. E.), Cree (C.), Jones (W. W.), Riehl (L. A.), Sinclair (W. B.), Parker (E. R.), Stewart (W. S.), & Turrell (F. M.). **Water spot of Navel Oranges.**—*Calif. Citrogr.*, 34, 3, pp. 122–126, 1 fig., 1949.

Water spot of Navel oranges [*R.A.M.*, 26, p. 486] causes serious economic losses in eastern Los Angeles and western San Bernardino counties when several days of continuous rain occur during the months January to April.

In order to find a substitute for oil sprays which increase the incidence of water spot [ibid., 21, p. 368], a number of organic insecticides was tested. During 1947–48, in rain chamber tests, paranthion, which is most effective for red scale control, reduced water spot in sprayed fruits by 43 per cent. Further tests with this material as well as with DDT are in progress. Fruit from trees treated with 2,4-D also showed a reduction in water spot, probably due to the effect of the growth regulator in delaying maturity. Of the many varieties tested all except the commercially undesirable Golden Nugget, Australian, and some unknown varieties were susceptible. Various stocks had no effect on susceptibility.

Growers are advised to fumigate trees with hydrocyanic acid instead of using oil sprays, to harvest early in the season, to reduce the humidifying effect of cover crops by mowing, to control weeds with oil or by cultivation, and to use nitrogen fertilizers.

STEWART (W. S.). **Effect of plant growth regulators on stored Citrus fruit.**—*Calif. Citrogr.*, 34, 2, pp. 58, 80–84, 1 fig., 1948.

The results of tests initiated in 1947 by the Ontario Fruit Growers' Exchange, California, and the University of California Citrus Experiment Station, confirmed previous findings that spraying with 8 or 16 p.p.m. 2,4-D (dichlorophenoxyacetic acid) [*R.A.M.*, 28, p. 123] or 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) either during the three months before harvest or in the packing house considerably reduced the incidence of black buttons and *Alternaria* [*citri*] decay of stored lemons and grapefruits. In pre-harvest tests 2,4,5-T was four to five times more effective than 2,4-D.

'Light green' lemons dipped for two minutes in a lanoline emulsion containing 500 or 1000 p.p.m. acid equivalent of the butyl ester of 2,4-D prior to storage, showed no black buttons or decay after 115 days, 3 per cent. black buttons and no decay after 162 days, while 'green' lemons thus treated remained free from both after 162 days. 'Green' lemons treated with 2,4-D vapour for 69 hours at the beginning of storage also showed a decrease of decay and black buttons compared with non-treated fruit.

Various other means of applying both growth regulators during storage are suggested.

BIALE (J. B.). **Respiration of Citrus fruits in relation to metabolism of fungi. II. Effects of emanations of Penicillium digitatum, Sacc. on Lemons at different stages of ripeness.**—*Proc. Amer. Soc. hort. Sci.*, 52, pp. 187–191, 2 graphs, 1948.

In further studies at the University of California [*R.A.M.*, 20, p. 399] lemons, subjected to emanations of *Penicillium digitatum* at different periods during storage, showed increases in the rates of respiration from 60 to 100 per cent. over the untreated controls. The maximum percentage responses to mould vapours (estimated by comparing the maximum carbon dioxide values reached with the respiration rates immediately preceding the introduction of the moulds) for dark green, light green, silver, and tree ripe fruits were 100, 82, 55, and 46, respectively.

In all cases exposure to the emanations of the fungus resulted in a marked reduction of storage life of lemons, as indicated by colour changes, onset of *Alternaria* [*citri*] rot, and shedding of stem ends.

HWANG (L.). **Spraying experiments to control Citrus canker.**—*Phytopathology*, 39, 3, pp. 177–181, 1949.

In three out of the four years 1940 to 1943 the incidence of citrus canker (*Pseudomonas* [*Xanthomonas*] *citri*) in orchards of five-year-old orange and grapefruit trees in Kwangsi Province, China [*R.A.M.*, 26, p. 393], was reduced by spraying with Bordeaux mixture (4–6–50) or Bordeaux–oil emulsion. Spray schedules adjusted to the appearance of new foliage flushes or to the temperatures favourable

to infection by the pathogen (20° to 35° C. according to Peltier in *J. agric. Res.*, 20, pp. 447–506, 1920) were effective if begun early in the growing season and continued until late September. Lime solution (1 in 500), advocated by Lee as the cheapest and most effective spray against *X. citri* (*Philipp. J. Sci.*, 17, pp. 325–341, 1920), proved less satisfactory then Bordeaux in these trials. Owing to the prevalence in Kwangsi of woolly aphis [*Gilletteella cooleyi*] and scale insects, the Bordeaux–oil emulsion will probably be the most useful and economical material for general orchard practice. In a single season (1943) it gave good control of the disease in two-year-old sour orange Kiang-tsin seedlings, but failed to protect those of the very susceptible Sunki and Mou-yu sweet orange against attack by the bacterium. Sprays for nursery practice cannot be recommended on the basis of experience to date.

Toovey (F. W.). **Seventh Annual Report 1946–47, Oil Palm Research Station, Nigeria.**—110 pp., 1 plan, 1948.

Falling yields of oil palms at Nkwele, Nigeria, have been accompanied by symptoms previously described as 'yellowing' [*R.A.M.*, 26, p. 487], but for which 'bronzing' is now considered the better term. The important manurial experiment laid down in 1940 [ibid., 22, p. 248] has conclusively shown that the trouble is due to a deficiency of some constituent of ash. The beneficial effect of the wood ash applied in 1941 and 1942 appears to be wearing off, and in 1947 the health of the treated palms was not much better than that of the controls. The effect showed marked periodicity, the treated trees deteriorating markedly in health at the end of the rains or later in the dry season. In a small-scale manurial trial in 1944–5 potassium applications [in the form of ash] at the rate of 20 lb. per tree increased the total weight of bunches obtained in 1946 from 100 to 650 lb. In further experiments badly affected palms treated with 90 lb. ash in 1943 showed appreciable improvement, the yields being raised in the three following years to about 70 lb. of bunches per tree. In terms of potassium fertilizer the dressing works out at about 3 lb. per palm, so that for a really satisfactory response about 3 cwt. per acre would be required. This would probably be prohibitive at present prices. Spectrographic analyses appear to have established that bronzing is due to potash deficiency.

Clear indication has been obtained that susceptibility to 'patch yellowing' [*Fusarium oxysporum*: ibid., 28, p. 124] is inherited. All trees selected for seed production are to be tested for resistance to various diseases as soon as the necessary technique has been developed.

Very serious losses are caused in the nurseries by a root disease which appears at the end of the rains. The outer leaves turn yellow, then brown, and wither, appearing as if 'blasted' by fire. When an affected seedling is cut open, the apical bud is often charred and rotten. If the disease is not arrested, the seedling eventually dies. Many of the roots of dying seedlings are rotted throughout their entire length or up to an inch or so from the base of the plant; the cortex readily sloughs off, leaving the central conducting strand. At the Research Station the disease has been serious every year. On an average, about 20 per cent. of the seedlings are destroyed, but many others scarcely survive the dry season. These latter are usually very backward and not large enough for planting out in the next rains. Hence, only about half the seedlings in a nursery had eventually become available for transplanting. There are indications that the disease may prove to be controllable by suitable cultural treatment. Investigations are in progress.

About four years after palms have been planted out they may become affected by a disease referred to as 'basal decay'. This appears as a chlorotic condition of the outer leaves, which soon die, the inner leaves becoming similarly affected. The condition is rapidly fatal. When a dead or dying palm is dug up and sectioned, an extensive rot is observed at the base, dry and spongy at first but later giving place

to a wet rot with a putrid odour. A non-lethal 'crown disease' [cf. ibid., 18, p. 579; 20, p. 7] appears to be confined to Deli palms, though a few cases have been seen in Angola palms from Sierra Leone, due probably to outcrossing with Deli palms.

Bogaty (H.). **Deterioration of Cotton textiles exposed to the weather.**—*Amer. Dyest. Reptr*, 38, 6, pp. 253–259, 1 fig., 10 graphs, 1949.

The data here presented are part of those obtained in the course of an inquiry into some aspects of 'tropical' deterioration of cotton textiles initiated at the National Bureau of Standards, Washington, D.C., early in 1945 at the request of the National Defense Research Committee. It was found that cotton fabrics treated against mildew with copper naphthenate deteriorated more rapidly on outdoor exposure than did untreated samples. Free copper sulphate does, in general, contribute to the acceleration of tendering. Copper naphthenate prepared in the laboratory from copper acetate was not so effective a fungicide as commercial copper naphthenate under conditions involving soil contact. Phenyl salicylate (salol), an ultra-violet radiation-absorber, did not inhibit or reduce the degradation of copper naphthenate-treated cotton exposed to weathering, but an anti-oxidant, pyrogallol (2 per cent. plus 0·8 per cent. copper naphthenate) gave some promise in this respect, and further experiments with it should be undertaken. The role of the agencies comprising 'weather' requires further elucidation. Fabrics lose copper when exposed in a dry climate without rainfall, so that the amount of precipitation cannot be the sole climatological factor concerned in the disappearance of the fungicide. Fabrics treated with copper phenyl naphthenate deteriorated at about the same rate as the copper naphthenate-treated samples in weathering exposures, but were somewhat more resistant to soil contact.

Müller-Kögler (E.). **Laboratoriums- und Freilandversuche mit Kiefernspanner-raupen und zwei insektentötenden Pilzen.** [Laboratory and outdoor experiments with Pine geometrid caterpillars and two insecticidal fungi.]—Reprinted from *Z. angew. Ent.*, 28, 4, pp. 613–645, 4 figs., 10 graphs [1942. Received December, 1948.]

The results of laboratory experiments indicated that the optimum relative humidity for the establishment of infection and the progress of the disease induced in the larvae of *Bupalus piniarius*, an increasingly troublesome pest in Mecklenburg pine forests, by *Spicaria farinosa* var. *verticillioides* [*Isaria farinosa* affinis] and *Beauveria bassiana* [*R.A.M.*, 28, p. 333] lies between approximately 94 and 100 per cent. However, at 78, 60, and 34 per cent. also the mortality of the inoculated caterpillars exceeded that of the controls, and only at 17 and 0 per cent. were the differences between the two series negligible. Inoculations with *S. f.* var. *verticillioides* were successful at 0·5° C., at which temperature the tests with *B. bassiana* gave negative results. Both fungi caused infection at 8°, 18°, and 25°, *S. f.* var. *verticillioides* acting more rapidly at the lowest and *B. bassiana* at the two higher temperatures.

Outdoor experiments in the inoculation of the caterpillars were undertaken with the aid of specially constructed traps known as 'isolators'. Although they were interrupted by frost on the 13th day, there were clear indications that the disease had contributed to the mortality of the caterpillars, and the use of the two fungi for the initiation of forest epidemics is regarded as a practical possibility.

Debsarma (G. D.). **Biochemical investigations on Jute retting. I. Isolation of micro-organisms from Jute retting pit, their characterization and their action on Jute stems.**—*Indian J. agric. Sci.*, 16, 5, pp. 453–458, 1947. [Received April, 1949.]

In the course of investigations into the micro-organisms associated with the

jute-retting process carried out at University College of Science and Technology, Calcutta, in addition to various bacteria two species of *Penicillium*, one of *Mucor*, and one of *Aspergillus* were isolated. These fungi were unable to ret jute stems in a sterilized jute stem medium (5 per cent. green stems plus water) when they were submerged 2 to 3 ins., but when the stems were made to lie on the surface of the medium one of the *Penicillium* strains (F_2) induced retting in 25 days at 30° C.

Grente (J.). **Influence des attaques de mort-lin sur le rendement du Lin cultivé. I. Influence sur le rendement en fibres.** [Influence of attacks of 'mort-lin' on the yield of cultivated Flax. I. Influence on fibre yield.]—*Ann. Épiphyt.*, N.S., 14, pp. 27–37, 2 figs., 3 graphs, 1948.

Investigations carried out in France in 1946 to determine the effects on yield of flax fibre due to the disease known as 'mort-lin', now stated definitely to be caused by *Ascochyta linicola* [*R.A.M.*, 26, p. 301], showed that the Stormont Gossamer variety which was severely affected had suffered a loss of straw yield of at least 10 per cent. The percentage of visibly infected stalks was 20, the reduction in length was 4 and in diameter 14 per cent., the reduction in the percentage ratio of fibre surface to total surface being 40 per cent., and the loss in weight of the stalks 30 per cent. All these figures are statistically significant, and the loss in fibre was calculated to be at least 12 per cent., this quantitative loss being accompanied by a qualitative one.

Camici (Leontina). **Rhizoctonia solani Kühn e correlazioni tra fattori parassitari e non parassitari nel 'deperimento dei Garofani' della Riviera Ligure.** [*Rhizoctonia solani* Kühn and correlations between parasitic and non-parasitic factors in 'Carnation wilt' on the Ligurian Riviera.]—*Ann. Sper. agr.*, N.S., 2, 5, pp. 653–669, 7 figs., 1948. [English summary.]

In studies on carnation wilt [*R.A.M.*, 16, p. 463; 25, p. 344; 28, p. 217] as found at San Remo and near Bordighera the author examined adult plants with root and collar lesions, young plants 10 to 15 cm. high showing few or no symptoms, and cuttings which appeared to be more or less unaffected but soon developed symptoms. The superficial roots of adult plants showed a brown discoloration of the cortical layer and brown stripes in the woody tissue; the cortex, at the level of the collar, was flaccid and readily became detached and the woody cylinder was chestnut-red. This discoloration, which occasionally involved the whole thickness of the xylem, extended along the stem for a few centimetres. The growth above was progressively yellowing. The symptoms were those known to the local growers as 'collar disease'. Some of the young plants tended to break at the third (occasionally, the second or fourth) node, where there was a lesion or dry spot which involved the node and spread lengthwise to adjacent nodes. In the affected part the tissues were dry, cracked, and fragile. Twenty-five to 30 days after potting, all the young plants developed wilting and (in some cases) collar and stem rot, or (in others) violaceous spotting of the stems.

Isolations from collar lesions of adult plants invariably gave *Rhizoctonia* [*Corticium*] *solani*, while those from the top of the stem, near the branches, gave *Fusarium*; both types were also isolated, separately or together, from badly wilted young plants or cuttings. Two strains of *C. solani* were isolated and several of *Fusarium*, five most commonly, one of which, with conidia measuring 7 to 12·5 by 2 to 3 μ and chlamydospores 4 to 5·5 by 4 to 5 μ, is referred to (?) *F. scirpi* var. *acuminatum* [ibid., 15, p. 654].

Soil and wound inoculations of healthy, three-months old carnations in pots were made with *C. solani* from carnation, potato, bean [*Phaseolus vulgaris*] and cabbage, and with all five strains of *Fusarium*. The experiments were made at (A) 10° to 20° C., normal atmospheric humidity, (B) 20° to 24°, normal humidity, (C) 27°,

saturated humidity. All the inoculated plants in set A were still healthy after four to five months, and in B after one month and a half. Both series were then transferred to dry conditions for ten days. Shortly after watering had been resumed, the B series began to wilt, though the others remained healthy. The particular strain of *C. solani* used for inoculation was, except in the case of the bean isolate, re-isolated from the wilted plants. *C. solani* was always obtained from the base of the stem, the upper part yielding *Fusarium*. From the plants inoculated with *Fusarium* different strains from those used were isolated, or the same strains in association with others.

In series C, the plants in soil inoculated with *C. solani* showed no sign of infection for 20 to 25 days, after which they suddenly wilted. The extremities of the branches, beginning with the lowest, turned yellow and drooped, though the stem and collar remained unaffected. Tissues from the stem and branches gave only *Fusarium*. The plants inoculated with *C. solani* by wounding developed collar and stem rot in ten days, with apical withering, the progress of infection being even more rapid in plants whose root systems had been reduced before inoculation. The rotted parts invariably gave *C. solani*, while the branches gave *Fusarium*, mostly strains 1 (? *F. scirpi* var. *acuminatum*) and 2. The plants given wound inoculations in the stem with *Fusarium* strains 1 and 4 developed characteristic apical wilt of the branches after a fortnight.

It is concluded that the etiology of carnation wilt, as found on the Ligurian Riviera, is complex and not yet fully understood. The principal agent is *C. solani*, which causes collar rot. The *Fusarium* strains, of which the commonest and most active is ? *F. scirpi* var. *acuminatum*, may have a primary or secondary parasitic action.

Diseased plants should be removed and burnt, the holes disinfected with 0·25 per cent. uspulun used in sufficient quantity to saturate the soil, and the surrounding healthy plants treated with 0·2 per cent. uspulun. The soil may be sterilized with formalin. In new plantings cuttings from healthy plants should be disinfected before use. Good cultural conditions should be maintained and care taken to keep down agents which may facilitate fungal entry.

Tisdale (W. B.) & Ruehle (G. D.). **Pythium root rot of Aroids and Easter Lilies.**—*Phytopathology*, 39, 2, pp. 167–170, 2 figs., 1949.

Since 1943 Chinese Evergreen (*Aglaonema simplex*), cultivated as an increasingly popular ornamental in Florida, has been affected by root rot due to a species of *Pythium* in Orange County nurseries.

Stunting is the first symptom of the disease on the aerial parts of the plants. It is followed by drooping of the leaves, yellowing, and death of the basal ones. Finally some of the stems rot off at soil-level and the plants drop over, but decay of the stems does not seem to continue. Early root symptoms are light brown, water-soaked lesions of varying length. At a later stage the diseased tissue turns brown and disintegrates, so that most of the infected roots remain in the soil when the plants are removed. In the end all the roots have rotted and nearly all the leaves up to the bud are dead. Many mulched plants form roots above ground-level and these develop infection on coming into contact with the soil. Several other aroids planted under sheds with *A. simplex*, including *Dieffenbachia picta*, *Nephthytis afzelii*, *Philodendron cordatum*, and *Scindapsus aureus*, showed similar but milder symptoms.

Easter lilies [*Lilium longiflorum* var. *eximum*] in Dade County also sustained heavy damage from *Pythium* root rot in 1944, and since 1945 their commercial cultivation has been practically discontinued in the affected area. This is situated on soil of the Rockdale series, very different from the low, sandy soil used for the production of *A. simplex*, which is maintained in a state of high fertility by the addition of muck, compost, and commercial fertilizers.

Of the various fungi obtained consistently in cultures from all the diseased plants, only *P. splendens* induced typical root rot symptoms in inoculation and cross-inoculation experiments [*R.A.M.*, 26, p. 147]. The fungus has been reported to attack a wide range of hosts [ibid., 22, p. 373], among which, however, those here specified were not included. When rooted *A. simplex* cuttings and young Easter lily plants were set in inoculated soil held at moderate temperatures, lesions developed on the roots within ten days and the root systems were almost entirely destroyed in three weeks. High temperatures were less favourable to the development of the pathogen.

In a preliminary soil sterilization test, treatment with ½ gal. formalin solution (1 in 50) resulted in about 85 per cent. good plants. On reaching marketable size, however, they showed a few lesions, denoting reinfestation of the beds before this stage. This would have to be prevented by treatment of the pathways between beds and bed wall-boards. Of several new fungicides tested, only tersan and fermate (1 or 2 gm. per l. water) eliminated infection without injuring the roots of potted plants, but neither was effective in outdoor experiments. The propagation of clean *A. simplex* stock in steam-sterilized soil on greenhouse benches has produced healthy plants, but this method can only be practised on a small scale.

Sonderman (C. H.) & Maclean (N. A.). **Rhizoctonia neck and bulb rot of Iris in the Pacific Northwest.**—*Phytopathology*, 39, 2, pp. 174–175, 1 fig., 1949.

For the past two years a neck and bulb rot of the Wedgewood variety of *Iris tingitana* hybrid has been observed in the Puyallup and Mount Vernon districts of Washington, where the more common crown rot (*Sclerotium delphinii*) [*R.A.M.*, 15, p. 99] is also present. The symptoms of the two diseases, however, are distinct. In crown rot, numerous small, dark reddish-brown sclerotia are associated with a decay of the tissue at the base of the leaves and flower stalks. The affected leaves die back from the tips and the tops fall over. In the neck and bulb rot, a soft, light brown rot at the neck causes the death of all above-ground parts without any die-back of the leaf tips. In severe cases of the latter disease dark brown lesions develop on the outer scales, and the bulbs may be almost entirely rotted away. The neck and bulb rot symptoms resemble those caused by *Rhizoctonia* [*Corticium solani*] on tulips in Washington [ibid., 27, p. 323], and the fungus isolated from diseased tulips on 2 per cent. potato dextrose agar, with hyphae 5·5 to 8 μ in diameter, is also referred to this species.

McClellan (W. D.), Baker (K. F.), & Gould (C. J.). **Occurrence of the Botrytis disease of Gladiolus in the United States in relation to temperature and humidity.**—*Phytopathology*, 39, 4, pp. 260–271, 3 figs., 1949.

Infection of the foliage of three *Gladiolus* varieties, Picardy, Early Rose, and Pacifica, with *Botrytis gladiolorum* [*R.A.M.*, 26, p. 245] under controlled conditions, with humidity maintained at or near saturation, at the Plant Industry Station, Beltsville, Maryland, was most severe at 55° and 65° F. At 35° and 75° there were comparatively few lesions on the leaves. The optimum temperature for the infection of freshly harvested corms was 35°. Some also occurred at 45° but none at 55° or upwards, nor were any lesions found on corms cured for 18 days. The absence of infection on cured corms and on those inoculated and incubated at high temperatures was attributed to the rapid suberization and wound periderm formation proceeding under these conditions. The husks of corms inoculated and incubated at or above 45° were darkened and the rotted areas were very dark in contrast to the paler colour of the husks and the less sharply defined lesions in the batch held at 35°.

Similar corm infection, sporulation, and sclerotial formation resulted from inoculations made with a monospore isolate of *B. gladiolorum* from California and

one of *Sclerotinia draytoni*, described from England by Buddin and Wakefield [cf. ibid., 26, p. 172]. In a personal communication to the authors, F. L. Drayton stated that in his and [J. W.] Groves's opinion, *B. gladiolorum* is the conidial state of *S. draytoni*. Wade [ibid., 25, p. 394] referred the *Botrytis* he studied to *B. gladioli* but from the spore measurements it was presumably *B. gladiolorum*.

At Puyallup, Washington, in 1946 the percentage of infection by *B. gladiolorum* on Picardy corms was lowest in early diggings and highest in the last of six at fortnightly intervals, the percentages on 24th September and 8th October being only 2·43 and 2·88, respectively, as against 27·61 on 16th December.

The occurrence of the rot due to *B. gladiolorum* is discussed in the light of the data here presented. It is concluded that the regional prevalence of both the foliar and corm rot phases of the disease are predictable with the aid of weather records. For instance gladiolus cultivation is likely to be very hazardous when temperatures between 55° and 65° F. obtain for 4 months of the growing period accompanied by abundant rainfall or heavy fogs.

Magie (R. O.) & Miller (H. N.). **Controlling storage rot of Gladiolus.**—*Bull. N. Amer. Gladiolus Coun.*, 16, pp. 47, 49, 1948. [Abs. in *Chem. Abstr.*, 43, 10, p. 3961, 1949.]

The bases of cleaned *Gladiolus* corms [in New York] were treated with one of the dust mixtures listed below or dipped in an aqueous suspension of the fungicide for storage rot [unspecified: see preceding and next abstracts] control. One month later 60 per cent. of the untreated and 89 to 95 per cent. of the treated corms were healthy, while the diseased corms from the untreated lots showed generalized decay. The fungicides, with the addition of DDT for thrips control in each case, were ranked in the following order of decreasing efficacy: (1) fermate 2 lb. plus 1½ lb. dow 9B [ibid., 27, p. 523 *et passim*] plus DDT 50W in 50 gals. water; (2) a half-and-half mixture of spergon and 5 per cent. DDT dust; (3) 1 lb. seedox [loc. cit.] plus 9 lb. 5 per cent. DDT dust; (4) fermate 1 lb., dow 9B 1 lb. mixed with 8 lb. 5 per cent. DDT dust; (5) arasan 2 lb. and parzate 1 lb. with 7 lb. DDT dust.

Simmons (S. A.). **Research on Botrytis corm rot.**—*Bull. N. Amer. Gladiolus Coun.*, 17, pp. 93–94, 1949. [Abs. in *Chem. Abstr.*, 43, 10, pp. 3961–3962, 1949.]

The results of inoculation experiments with *Botrytis* [? *gladiolorum*: see preceding abstracts] showed that the rate of progress of the infection within the corm reached a maximum at 7·2° C. and then declined, so that at 16·7° it was little higher than at 0°. A preliminary study of the effect of temperature on suberization round infected areas indicated considerable varietal differences in this respect. Dip treatments with copper A, lysol, and mercuric chloride gave promise of success. Good curing conditions, such as prevail in a greenhouse, are essential for the arrest of infection.

A significant reduction in the incidence of dry rot [*Sclerotinia gladioli*] was secured with pre-planting dips of new improved ceresan, lysol, and mercuric chloride.

Forsberg (J. L.). **A new method of evaluating fungicides.**—*Phytopathology*, 39, 2, pp. 172–174, 1 fig., 1949.

None of the laboratory methods in current use for the evaluation of fungicides is particularly adapted for application to *Fusarium*, so that the efficiency of preparations for the control of diseases like *Fusarium* rot of *Gladiolus* (*F. oxysporum* var. *gladioli*) [*R.A.M.*, 27, p. 476] has hitherto been assessed entirely on the basis of field

tests. A simple technique has therefore been developed to save time in screening fungicides active against the above-mentioned pathogen.

Several sterile pieces of No. 8 cotton thread 3 to 4 in. long are laid on the surface of potato dextrose agar in a Petri dish, in which the fungus is planted and allowed to grow until it covers the entire surfaces. The threads are then removed with sterile forceps and cut with sterile scissors into pieces about $\frac{1}{8}$ in. long which are collected in a sterile Petri dish and aseptically transferred to the fungicides. As a preliminary test, pieces of the fungus-infested thread are rolled in a small quantity of the dry fungicide until they are well coated and then planted in potato dextrose agar plates, which are held at about 22° C. for seven days and examined for fungal growth. Materials failing to inhibit growth completely are then discarded, while several concentrations of the effective substances are prepared for further testing. The infested threads are immersed in these prepared solutions for periods of predetermined duration, after which they are transferred to agar plates at 22° for seven days before examination for fungal growth.

The tabulated data of one test with *F. oxysporum* var. *gladioli* using this method show two factors to be involved in the process of inhibition, viz., the concentration of the fungicide and the length of exposure to its action. Dow 9B [ibid., 26, p. 450 *et passim*] was effective at 1 per cent. with an immersion period of only 15 minutes; at 0·5 and 0·25 per cent. one and two hours, respectively, were necessary to produce comparable results. Puraturf [ibid., 27, p. 476] at 2 per cent. eliminated the pathogen in 15 minutes, at 1 per cent. in 30, and at 0·5 per cent. in one hour. New improved ceresan at 0·047 per cent. was fungicidal in 15 minutes, at 0·031 per cent. in 30 minutes, and at 0·016 and 0·008 per cent. in one hour. At 0·06 per cent. puratized agricultural spray [loc. cit. and ibid., 28, p. 38] destroyed the fungus in 15 minutes, at 0·04 per cent. in one hour, and at 0·03 per cent. in two hours. Mercuric chloride was effective at 0·01 per cent. in 15 minutes, at 0·006 per cent. in 30 minutes, at 0·005 per cent. in one hour, and at 0·004 per cent. in two hours.

Mehlquist (G. A. L.) & Rahmani (R.). **Inheritance of resistance to rust in the Snapdragon, Antirrhinum majus.**—*Proc. Amer. Soc. hort. Sci.*, 52, pp. 481–486, 2 figs., 1948.

In breeding *Antirrhinum majus* plants resistant to rust (*Puccinia antirrhini*) [*R.A.M.*, 16, p. 387; 20, p. 581], field, greenhouse, and cold-frame inoculation experiments were carried out in 1944 and 1945 at Los Angeles, California, with F_1, F_2, and BC_1 plants, derived from 1943 crosses. The results obtained indicated that resistance to form 2 of the rust is controlled by a simple, partially dominant gene, designated R_2, that responsible for resistance to form 1 being labelled R_1. Since the gene R_2 is only partially dominant, resistance in the F_1 cannot be relied upon in controlling rust on plants grown from hybrid seed under conditions favourable to the disease development.

Noordam (D.). **Vaatziektebestrjding in Amerikaanse Anjers.** [Wilt disease control in American Carnations.]—*Meded. Direct. Tuinb.*, 11, 7, pp. 444–448, 1948. [English summary.]

Wilt of American carnations caused by *Phialophora* [*Verticillium*] *cinerescens* is a troublesome disease in Holland [*R.A.M.*, 26, p. 60], and hitherto it has proved refractory to control by means of steam sterilization, replacing the soil in the glasshouse by uncontaminated soil, and quadrennial crop rotation. In experiments described in this paper subsoil to a depth of 50 cm. carried infection and in a few cases a depth of from 50 to 75 cm. It is necessary, therefore, to sterilize the soil as far down as 50 cm. at least (more than 75 cm. is not necessary) and to allow a lapse of more than four years between each carnation crop.

Frandsen (N. O. C.). **Septoria helianthi Ell. et Kell. als Erreger einer Blattfleckenkrankheit auf Sonnenblumen.** [*Septoria helianthi* Ell. & Kell. as agent of a leaf spot disease on Sunflowers.]—*Phytopath. Z.*, 15, 1, pp. 88–91, 6 figs., 1948.

A perusal of the relevant literature disclosed only one reference to the occurrence of *Septoria helianthi* in Europe, namely, that by Oudemans [*R.A.M.*, 4, p. 506: but see ibid., 12, p. 571]. In the United States, however, the fungus is responsible for heavy damage to the sunflower crop [ibid., 4, p. 417], and it has also been reported from South Africa by Parnell *et al.* in Reports from (Cotton) Experiment Stations, 1929–1930, pp. 33–84, 1931. In the autumn of 1943 the characteristic symptoms of the leaf spot appeared in a small sunflower planting at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark (Germany). At 18° to 21° C. yellow spots, 2 to 15 (very often 5 to 10) mm. in diameter, develop over the entire leaf blade, mostly on the upper surface. They gradually turn brown and present a polygonal aspect due to their sharp delimitation by the veins. In places they merge directly into the healthy, green tissue, elsewhere they are more or less surrounded by the pale olive-green areas of secondary infection. The latter, like the lesions themselves, are dotted with numerous black pycnidia in regular alignment, visible to the naked eye. An increase of secondary infection in damp weather is accompanied by extensive defoliation.

The branched, hyaline mycelium, growing intercellularly through the parenchyma, forms on both leaf surfaces, predominantly on the upper, spherical pycnidia, the apex of which eventually penetrates the epidermis, opens by means of a small ostiole, and when moistened discharges a white, viscous mass, consisting of hyaline, straight or rather irregularly curved conidia, tapering towards the apex and truncated at the base, measuring 40 to 70 by 2 to 4 μ (mostly 60 to 65 by 3 to 3·5 μ), with 3 to 5 septa, often indistinct. Germination in distilled water is slow, eight to ten hours being required for the production of germ-tubes, and so is growth on nutrient media; oat agar was preferable to potato dextrose. The fructifications assumed various forms in culture, including free conidia and pycnidia with long beaks. Inoculation experiments in June and July, 1944, with conidial suspensions (*a*) of fresh material from outdoor plants, (*b*) from 10- or 11-month-old leaves overwintered in a press, (*c*) from a monospore culture, and (*d*) with mycelium were uniformly successful, infection developing in about nine days at 18° to 21°. Jerusalem artichoke (*Helianthus tuberosus*), *H. mollis*, and *H. scaberrimus* were not infected by *S. helianthi*.

The pathogen evidently overwinters in a thriving condition on plant refuse in the soil, as shown by its repeated occurrence on quite a small area in 1943 and 1944. Possibly it may have originated in an assortment of *Helianthus* species and forms, some from North America, which had previously been cultivated on the same site. Plant sanitation and regular renewal of seed are the best control measures both against the leaf spot and the much more serious *Sclerotinia* [*sclerotiorum*].

Kreitlow (K. W.). **A greenhouse bench moist chamber for large scale inoculations.** —*Phytopathology*, 39, 1, pp. 90–91, 1 fig., 1949.

In the course of a breeding programme, it is often desirable to test large numbers of plants under controlled conditions for resistance to specific diseases, in many of which high humidity for a given period is necessary to induce infection. However, an ordinary greenhouse often fails to provide the requisite degree of humidity, and during the last two years a moist chamber of simple design with a capacity of 26 flats (12 by 24 in.) or 400 pots (4 in.) has been in operation at the United States Regional Pasture Research Laboratory, State College, Pennsylvania.

The framework consists of 2 by 2 in. uprights, which are fastened at each inside corner of the bench. Wooden braces were secured to the uprights and wires stretched

the length of the bench were also attached to them. Another wire was fastened to the greenhouse frame to support the peak of the roof for the chamber. Clear parafilm plastic shower curtain material was then spread over the wires to form a canopy. Strips 15 by 3 ft., long enough for the ends to reach below the sides of the bench, overlapped about 2 in. at the edges, and each one thus formed a panel easily folded back to give access to plants in any part of the chamber. The ends of the chamber were fashioned of the same material, cut to fit and tacked to the wooden brace between the uprights. The upper portions were pinned to the nearest canopy panel. At one end of the chamber a hole was cut in the parafilm to admit moisture from a Model 42 humidifier, manufactured by the Standard Engineering Works, Pawtucket, Rhode Island. The unit draws water up the outer surface of an enclosed cone rapidly rotated by an electric motor and throws it against the vanes of a circular grid, where it is broken into a fine mist and blown into the chamber through an adjustable elbow. An automatic time clock turns the appliance on and off 15 minutes out of every hour from 7 a.m. to 7 p.m.

The artificial fog is circulated to all parts of the chamber within one minute after the humidifier starts to operate. The moisture particles are small and settle slowly and uniformly, covering the plant leaves with a film resembling dew. The tenacious, mildew-proof parafilm canopy admits sufficient light to prevent etiolation of plants even after 10 to 14 days in the chamber. Under these conditions highly satisfactory results have been obtained in large-scale inoculation tests with *Sclerotinia trifoliorum* on forage legumes, as well as with foliar diseases, such as *Puccinia coronata* on *Festuca elatior* and *Stemphylium sarciniforme* on red clover.

KREITLOW (K. W.). **Sclerotinia trifoliorum, a pathogen of Ladino Clover.**—*Phytopathology*, **39**, 2, pp. 158–166, 3 figs., 1949.

In the spring of 1945, and again in 1946, severe infection by *Sclerotinia trifoliorum* was observed at State College, Pennsylvania, on the stolons of the Ladino variety of *Trifolium repens*, usually regarded as resistant to the fungus [*R.A.M.*, 17, p. 253]. Monoascospore isolates, obtained by a modification of Tapke's technique [ibid., 25, p. 406], yielded four cultural types on potato dextrose agar classifiable as (1) closely appressed mycelium, no sclerotia; (2) appressed mycelium towards the centre but the outer quarter of the colony composed of flocculent, white mycelium, no sclerotia; (3) mostly appressed mycelium with an outer fluffy ring containing a few large, compound sclerotia; and (4) like the foregoing, but with many sclerotia round the outer edge of the colony.

Ladino seedlings inoculated with material from fresh grain (2 parts wheat to 1 of oats) cultures and kept moist at 18° to 20° C. showed drooping of the leaves and petioles after three or four days. The foliage usually turned grey-green as though scalded, and the infected seedlings became flaccid and soon afterwards collapsed, most being dead a week to ten days after inoculation. For the pathogenicity trials 28 monoascopore cultures representing isolates from 13 apothecia and each of the four cultural types were selected. The inoculated Ladino and red clover plants were at first incubated in a large moist chamber [see preceding abstract] in a greenhouse at 18° to 20°, but when warmer weather supervened they were transferred to a constant temperature cold room at 15°, where illumination was provided by 150-watt Mazda lamps for 12 hours daily. Most of the isolates from both species of clover were equally pathogenic to each host. There was some indication of differences in virulence between the several isolates, and further tests to verify this observation were carried out on a larger scale on potted plants, the stolons of which were inoculated with one pathogenic isolate (L–6–8) from Ladino, one (R–1–4) from red clover, and a less virulent one from each host (L–1–10 and R–3–8). The plants were incubated at 15° and illuminated as described above. In this way striking differences in pathogenicity were detected. For instance, the degree of

infection induced by R–1–4 was rated as severe + on 17 out of 72 plants, severe on 24, moderate + on 11, and moderate on 12, the corresponding figures for L–6–18 (64 plants) being 10, 21, 14, and 8, respectively. The other two isolates caused no severe or moderate + infection, but 14 out of 72 reacted to R–3–8 and 15 out of 60 to L–1–10 with symptoms of moderate intensity.

Most of the other species of *Trifolium* and species of *Medicago* and *Melilotus* tested for their reaction to inoculation with a composite sample of seven pathogenic monoascospore isolates of *S. trifoliorum* were susceptible [ibid., 27, p. 365] both in the seedling and adult plant stages. At least three, however, sustained less severe damage than the rest, namely, *T. resupinatum*, *T. fragiferum*, and *T. dubium*, especially the last-named.

Research into blind seed disease of Ryegrass.—*N.Z.J. Agric.*, 77, 6, pp. 609, 611–612, 6 figs., 1948.

This article outlines the programme of New Zealand research work on blind seed disease (*Phialea temulenta*) [see above, p. 378] of perennial rye grass [*Lolium perenne*] which has resulted from meetings of the Blind Seed Disease Committee. Recent studies on the mycological aspect of the disease carried out at the Plant Diseases Division, Auckland, have revealed that a temperature of between 50° and 60° F. and relative humidities of up to 100 per cent. are ideal for the rapid spread of the fungus.

Buchholtz (W. F.). **A comparison of gross pathogenic effects of Pythium graminicola, Pythium debaryanum, and Helminthosporium sativum on seedlings of Crested Wheatgrass.**—*Phytopathology*, 39, 2, pp. 102–116, 5 figs., 1949.

Crested wheatgrass (*Agropyron cristatum*) seed, planted in certain field soils in central South Dakota, may either be rotted during the initial stages of germination, or germinate and produce seedlings which develop normally for one to three weeks, when wilting, stunting, and indirect necrosis of the leaves or whole plants ensue.

Isolations from rather more than 400 root fragments of greenhouse-grown seedlings in the winters of 1940–1 and 1941–2 disclosed the presence, in descending order of predominance, of *Pythium graminicola* [*R.A.M.*, 22, pp. 26, 313], *Fusarium* spp., *P. debaryanum*, and *Helminthosporium sativum* [loc. cit.] (158, 81, 71, and 6 times, respectively). *Rhizoctonia* spp. were isolated only twice. All these fungi except the last-named were recovered from field-grown crested wheatgrass seedlings. In infestation experiments in steamed soil, using entire potato dextrose agar cultures, *P. graminicola* was pathogenic to germinating seed and seedlings (up to 28 days old) of *A. cristatum* even at a distance of 2 in. from the seed, inducing a wilt comparable to that of seedlings in non-steamed field soil. *P. debaryanum* was injurious to germinating seed when placed 1 in. but not 2 in. below it, and may have been pathogenic to very young seedlings; it did not, however, cause typical wilting. The effects of *H. sativum* were variable, but it was generally pathogenic in proximity to germinating seed and damaged very young seedlings, though the characteristic wilt symptoms were not observed. In non-steamed soil taken from a plot of brome grass sod, only *P. graminicola* induced typical wilting and stunting of crested wheatgrass seedlings.

In isolations at intervals of 1 to 33 days from germinating seed and seedlings of *A. cristatum* in lots of soil from plots variously infested, *P. debaryanum* tended to decrease and *P. graminicola* to increase on the isolation plates with the lapse of time after planting. On the other hand, *H. sativum* conformed to no particular time pattern in relation to the development of seed-rotting or seedling blight, nor could any definite connexion be established between the occurrence of these manifestations and the incidence of the fungus on the isolation plates.

In these experiments *P. graminicola* clearly duplicated the symptoms of seedling

blight and may be regarded as its agent. The absence of *P. graminicola* and the abundance of *P. debaryanum*, with its well-known capacity to interrupt germination, on germinating seed, leads to the conclusion that the latter organism is the principal factor in seed decay. *H. sativum* may play a minor, atypical, and inconsistent part in both seed-rotting and seedling blight.

Patel (M. K.), Kulkarni (Y. S.), & Dhande (G. W.). **Dolichos biflorus L.—a new host of Xanthomonas phaseoli sojense (Hedges) Dowson.**—*Curr. Sci.*, 18, 3, pp. 83–84, 1949.

In August, 1948, *Dolichos biflorus*, grown as a pulse and fodder crop in the Belgaum district of Bombay, was attacked by a leaf spot resembling that of soy-bean caused by *Xanthomonas phaseoli* [var.] *sojense* [*R.A.M.*, 18, p. 368]. The leaves of *D. biflorus* bore on both sides raised, rough lesions edged with light brown and 1 to 2 mm. in diameter; the petioles also were infected. The bacterium isolated from *D. biflorus* was sprayed on two varieties of the same host, one black- and the other brown-seeded, as well as on soy-beans. Both *D. biflorus* and soy-bean developed the typical symptoms of the leaf spot in ten days. Inoculation tests with *X. phaseoli* var. *sojense* on the same two hosts likewise resulted in a characteristic outbreak of the disease. Since the *D. biflorus* organism resembles *X. phaseoli* var. *sojense* in morphological, cultural, and physiological characters and both pathogens are cross-inoculable, a new host of the soy-bean bacterium has apparently been discovered.

Grasso (V.). **Una nuova specie di Claviceps in Italia.** [A new species of *Claviceps* in Italy.]—Reprinted from *Nuovo G. bot. ital.*, N.S., 55, 4, 2 pp., 1 fig., 1948.

On the right bank of the Arno near Florence in October, 1948, the author found that up to 99 per cent. of *Paspalum distichum* plants in some places bore sclerotia very similar morphologically to those of *Claviceps*. If further examination confirms the author's view that the pathogen is *C. paspali* [*R.A.M.*, 27, pp. 24, 423], this will be the first record of the fungus in Europe. It is believed that the disease may have been introduced in imported animal fodder during the recent war.

Shear (C. L.). **Mycological notes. IX.**—*Mycologia*, 40, 6, pp. 748–759, 1948.

The author considers that the name *Venturia* should be conserved with *V. inaequalis* as the lectotype, and gives reasons for rejecting the name *Endostigme cinerascens* (Fleischhack) Jørstad [*R.A.M.*, 24, p. 453], which he points out was attributed to Fleischhack in error, the author cited by Rabenhorst for *Sphaerella cinerascens* being Fuckel. The specimen issued by Fuckel in Fungi Rhenani 824, however, was *Sphaeria cinerascens*, a later homonym of *S. cinerascens* Schweinitz. With the elimination of the epithet *cinerascens*, the well-known epithet *inaequalis* remains acceptable, being applied to the apple scab fungus by Cooke in 1866. The complete citation should be *V. inaequalis* (Cooke) Winter emend. Aderh. Notes are given on species of *Venturia* on the Ericaceae.

Bernaux (P.). **Note préliminaire à l'étude de l'évolution des tumeurs écidiennes de Gymnosporangium sabinae (Dicks.) Wint. dans la région méditerranéenne.** [A preliminary note on the study of the development of aecidial pustules of *Gymnosporangium sabinae* (Dicks.) Wint. in the Mediterranean region.]—*Ann. Épiphyt.*, N.S., 13, pp. 187–192, 1 diag., 2 graphs, 1947. [Received April, 1949.]

In studies carried out in the region of Montpellier during 1946 to determine the effect of the Mediterranean climate on the biology of *Gymnosporangium sabinae* [*R.A.M.*, 27, pp. 115, 387] attacking Doyenné du Comice and Beurré Giffard pears and the wild species *Pyrus amygdaliformis*, the most rapid development of one

spot took place in 115 days while the most protracted took 145 days. The normal time for development is four months.

A comparison between the time that the rust appeared on pears grown in cultivated soil and on moorland indicated that climatic and microclimatic influences, soil conditions, and the internal conditions of the tree all play some part in the development of the aecidia.

Naef-Roth (Stephi). **Untersuchungen über den Erreger der Schrotschusskrankheit des Steinobstes, Clasterosporium carpophilum, und über den Schrotschusseffekt.** [Studies on the agent of the shot hole disease of stone fruit, *Clasterosporium carpophilum*, and on the shot hole effect.]—*Phytopath. Z.*, 15, 1, pp. 1–38, 3 pl., 5 figs., 7 graphs, 1948.

The 26 isolates of the shot hole fungus, *Clasterosporium carpophilum*, from *Prunus* leaves studied at the Federal Technical College, Zürich, Switzerland, fell into two groups, small- and large-spored, the former having spores 11 to 16 μ by 4·5 to 8 μ and the latter 25 to 37 by 12 to 15 μ. Four of the small-spored isolates originated on sweet cherries, two on egg plums, and six on cherry-laurel (*P. laurocerasus*). Sweet cherry was also the host of ten of the large-spored strains, peach of two, and apricot and a garden variety (*rotundifolia*) of *P. laurocerasus* of one each. The dimensions of the large-spored group agree with those reported by previous workers, but no reference could be found in the literature to the small-spored forms. Apart from minor disparities in septation, size is the only morphological difference between the two groups. Biologically they differ slightly in their temperature requirements for mycelial development and conidial germination, mode of growth on artificial media, and capacity for sporulation. No connexion was apparent between the dimensions of the isolates and their respective hosts or places of origin, nor was there any indication of sex distinction.

The results of inoculation experiments revealed the very low infective capacity of all the small-spored isolates, while the original virulence of the large-spored group declined or disappeared in artificial culture. No evidence of physiologic specialization within the fungus was afforded by the reactions of the experimental hosts to sweet cherry isolates from different parts of the country, and no indication of the occurrence of distinct races on the several species of *Prunus* was observed. The pathological attributes of *C. carpophilum* are in no way restricted, and all the indigenous species and varieties of stone fruit may be attacked under conditions favouring the parasite.

The processes involved in the shot hole response to the fungus were studied on several of its hosts [*R.A.M.*, 6, p. 624] and found to exemplify Gäumann's idea of a histological antitoxic defence reaction [ibid., 25, p. 173]. The host protects itself against inundation with the metabolic products of the fungus, and those of its own cells killed by the invader, by the formation of a histogenic demarcation tissue. On the one hand, this secondary meristem cuts off the infection focus from the further supply of nutrient from the sound portion of the leaf, and on the other prevents the continued spread of the pathogen and interrupts the diffusion of the fungal toxins and products of disorganization of the necrotic cells. In some species of *Prunus*, e.g., peach and *P. laurocerasus*, the antitoxic defence reaction was rapidly accomplished; in the former host the line of demarcation appeared on the fifth to sixth day after inoculation and the extrusion of the necrotic tissues began on the ninth, while the corresponding period for the latter were the sixth to eighth and tenth to fourteenth days, respectively. In the two sour cherry varieties tested, on the contrary, the development of the shot hole effect was delayed for two to three weeks and was restricted to about half the infection foci.

The shot hole effect is not a specific reaction to *C. carpophilum*, having been experimentally induced in the three above-mentioned hosts by mechanical and

chemical injuries (treatment of the leaves with 50 per cent. copper sulphate or 10 per cent. formalin).

Mills (G. Barbara). **A biochemical study of Pseudomonas prunicola Wormald. 1. Pectin esterase.** *-Bio-chem. J.*, 44, 3, pp. 302–305, 5 graphs, 1949.

A manometric method is described for the determination of pectin-esterase activity, which has been used in a study of some of the properties of such an enzyme obtained from *Pseudomonas prunicola*, the agent of cherry and pear canker [*R.A.M.*, 24, p. 374]. The exo-enzyme is formed adaptively in response to growth in the presence of pectin, pectate, and galacturonic acid.

Wade (G. C.). **Apricot diseases.**—*Tasm. J. Agric.*, 20, 1, pp. 22–29, 5 figs., 1949.

Notes are given on the symptoms, causes, and control of the following apricot diseases in Tasmania: brown rot (*Sclerotinia fructicola*) [*R.A.M.*, 23, p. 474], shot hole and scab (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*: ibid., 21, pp. 338, 339; 22, p. 470], dieback or gummosis usually associated with a *Cytosporina* [cf. ibid., 25, pp. 347, 508; 26, p. 343], dieback due to a *Polystictus*, black heart (*Verticillium dahliae*) [cf. ibid., 26, pp. 230, 330; 27, p. 140], silver leaf, the cause of which (locally) has not yet been determined, bacterial canker (*Pseudomonas cerasi* var. *prunicola*) [*P. prunicola*: ibid., 25, p. 565], mosaic [cf. ibid., 18, p. 323; 27, p. 27], waterlogging, salt injury, mineral deficiency [cf. ibid., 27, p. 222], and gumming of non-parasitic origin.

The mosaic symptoms consist of an obvious mottling of the leaves, which are frequently puckered and distorted. The growth of affected trees is much less vigorous than is normal. The same disease also affects other stone fruits; on myrobalan plum paling and mottling of the leaves may be present, the mottling frequently taking the form of a striking pattern. Infected trees should be removed and burnt; buds from such trees and plum stocks showing these symptoms should not be used for grafting.

Apricots do not make satisfactory growth where drainage is inadequate, and if severe waterlogging occurs the trees die. Apricots on apricot stock are particularly sensitive to this condition.

Many trees show a leaf mottle distinct from mosaic and consisting of a regular pattern formed by a pale green colour between the main veins with normal green along the veins and midrib. Studies are in progress on this condition, which is at present attributed to mineral deficiency.

Willaume (M. F.). **Les traitements anticryptogamiques du Pêcher, de l'Abricotier et des arbres à fruits à noyaux.** [Fungicidal treatments of Peach, Apricot, and stone fruit trees.]—*Vitic. Arboric., Paris*, 95, 1, pp. 5–7, 5 figs., 1949.

After stating that the three principal diseases of peach and stone fruit trees in France are, in descending order of importance, leaf curl (*Exoascus* [*Taphrina*] *deformans*) [*R.A.M.*, 26, p. 285; 27, p. 510], shot hole (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*: ibid., 19, p. 104; 27, p. 75], and brown rot (*Sclerotinia fructigena* and *S. cinerea* [*S. laxa*]) [ibid., 27, p. 429], the author gives short, practical notes on their symptoms, development, and control by copper or lime-sulphur sprays.

Yeager (A. F.) & Richards (M. C.). **A new fall bearing Raspberry, Durham—and the spur blight problem.**—*Proc. Amer. Soc. hort. Sci.*, 52, pp. 263–264, 1948.

Examinations of red raspberry canes at the University of New Hampshire indicated that winter injury was generally associated with spur blight (*Didymella applanata*) [*R.A.M.*, 25, p. 125], which is considered to be the main cause for the unprofitable production of the crop.

Spraying with elgetol followed by fermate has not been effective in controlling

the disease. Viking [loc. cit.] is less susceptible than Latham and Taylor but no variety is known to be immune. The removal of canes in the spring before spores are produced eliminates the disease from a field, but results in the complete loss of that year's crop and consequently attempts were made to breed a variety which would yield heavily in the autumn on new shoots. By pollinating Taylor by Nectarberry (a trailing blackberry), such a variety, named Durham, was developed. Some plants are available commercially, and an abundant supply should be ready for distribution by 1950.

Zeller (S. M.) & Campbell (L.). **Synchytrium found on the roots of Strawberry.**—*Phytopathology*, 39, 2, pp. 149–151, 1 fig., 1949.

Marshall strawberry roots in Whatcom County, Washington, were observed in March, 1946, to bear galls measuring 2 to 4 by less than 1 mm. They formed either lateral growths on the rootlets or hook-shaped excrescences when within them. The bright yellow sori in or on the galls contained several rather thin-walled sporangia, 60 to 80 by 50 to 60 μ, mostly full of very motile, spherical, uninucleate, uniciliate zoospores, 1·5 to 2 μ in diameter. The normal growth of the plants was apparently not impeded by the fungus, the origin of which is unknown. The crop was growing on land first cleared of trees in 1939 and planted with strawberries from the same year until 1942 and again in 1945 after two years of green manures (rye and legumes). This appears to be the first authenticated record of a *Synchytrium* on strawberry, and it is accordingly designated *S. fragariae* n.sp.

Bailey (J. S.). **Further observations of mummy berry on cultivated Blueberries.**—*Proc. Amer. Soc. hort. Sci.*, 52, pp. 299–303, 2 graphs, 1948.

During recent years cultivated blueberries in Massachusetts have suffered considerable losses from mummy berry disease (*Monilinia* [*Sclerotinia*] *vaccinii-corymbosi*) [*R.A.M.*, 27, p. 30].

In experiments started in 1946 six to nine fermate applications (1½ lbs. per 100 gals.) gave hardly better control than when the first three sprayings (applied before the blossoms opened) were omitted, which suggests that infection takes place through the open blossoms. The results of the 1947 experiments demonstrated that fermate (2 lbs. per 100 gals.) plus goodrite p.e.p.s. sticker (which appears to have fungicidal properties) was most effective in controlling the disease, with a mean of 9·1 per cent. infection, the corresponding figures for fermate, Bordeaux, Bordeaux plus goodrite p.e.p.s., goodrite p.e.p.s. alone, and untreated control being 17·6, 31·9, 25·6, 23·3, and 34·7, respectively.

Burchfield (H. P.), Gullstrom (Delora K.), & McNew (G. L.). **Agricultural dusts. Preparation of dusts of uniform particle size by fractional sedimentation.**—*Analyt. Chem.*, 20, 12, pp. 1168–1173, 1 fig., 1 diag., 3 graphs, 1948.

A method based on fractional sedimentation is described for the isolation of particle size fractions from agricultural dusts [see next abstract]. Mathematical procedures are developed making it possible to estimate the type and number of sedimentations required, as well as the mean radius, particle size distribution, and amount of each fraction that will be obtained. The isolation of fractions of definitely known distribution is a help in the evaluation of such biological and physico-chemical properties as are modified by changes in particle size.

Gullstrom (Delora K.) & Burchfield (H. P.). **Agricultural dusts. Determination of particle size distribution.**—*Analyt. Chem.*, 20, 12, pp. 1174–1177, 5 graphs, 1948.

Particle size distribution of organic fungicides, e.g., arasan, spergon, and phygon [see preceding abstract], and insecticides, alone or in admixture with diluents, can

be determined at solid concentrations as low as 0·5 gm. per l. by the sedimentation pipette method supplemented by optical or polarographic procedures. The nature of the diluent used in grinding partially determines the distribution of the organic component of a mixture.

NANCE (NELLIE W.). **Some unusual or outstanding plant disease developments in the United States in 1947.**—*Plant Dis. Reptr, Suppl.* 177, pp. 143–169, 4 maps, 1948. [Mimeographed.]

After a brief review of the weather conditions which prevailed in the United States during 1947 a summary is given of the incidence of some unusual or outstanding plant disease developments during the year, records of all of which have appeared in recent numbers of either the *Plant Dis. Reptr* or *Phytopathology*.

MILBRATH (D. G.). **Certain diseases of plants.**—*Bull. Dep. Agric. Calif.*, 38, 1, pp. 5–24, 12 pl. (5 col.), 1949.

Brief descriptions are given of certain diseases which do not occur, or only infrequently in California: albino cherry, at present confined to Oregon [*R.A.M.*, 24, p. 156] and caused by a virus which belongs to the little cherry group of diseases; internal cork of sweet potato [ibid., 27, p. 8] reported from Maryland, North and South Carolina, Tennessee, Virginia, Georgia, Louisiana, and Mississippi; little cherry [ibid., 28, p. 222] now present in Oregon and Utah; peach wart [ibid., 27, p. 355] believed to be eliminated from California; elm phloem necrosis [ibid., 28, p. 256]; and Dutch elm disease (*Ceratostomella ulmi*) [ibid., 28, p. 6].

A disease of sweet cherry known as buckskin in California occurs in Green Valley where it resembles little cherry reported from Oregon, and also in Napa Valley where it resembles in part that reported from Washington. The author suggests it is practical to regard the whole group of these diseases as resulting from several distinct but related viruses or from several strains of a distinct virus.

VASUDEVA (R. S.). **Soil-borne plant diseases and their control.**—*Curr. Sci.*, 18, 4, pp. 114–115, 1949.

In this paper (a summary of the author's presidential address to the Section of Agriculture at the India Science Congress, Allahabad, January, 1949) it is stated that in India the loss from plant diseases has been estimated at about 10 per cent., much of it due to soil-borne pathogens.

The activity of a soil-borne parasite forms only part of a complex association of mostly non-pathogenic organisms and this is strikingly illustrated by the growth of the pigeon-pea wilt fungus *Fusarium udum* [*R.A.M.*, 26, pp. 44, 440; 27, p. 155] which is adversely affected by *Bacillus subtilis*, commonly present in soil. It is suggested that it may be feasible to adjust prevailing agricultural practices in such a way as to alter the microbial balance in the soil and so reduce parasitic activity. The importance of breeding for disease resistance is stressed.

Discussion of the collection and interchange of scientific records and experimental material including the safeguards that will have to be taken to minimize the risk involved in the distribution of plants, seeds and animals.—*Rep. roy. Soc. Emp. sci. Conf.*, 2, pp. 185–195, 1948.

In his contribution to this discussion A. E. MUSKETT (pp. 192–193) suggested a decentralization scheme for the collection and distribution of living cultures of micro-organisms. Provincial national centres would maintain collections of particular interest in their localities. Information as to available cultures would be sent regularly from the local centres to the central organization whence it would be

issued in catalogue form. The central organization would maintain stocks only when facilities were unavailable locally. Alternatively, such cultures would be passed to appropriate centres for propagation. Restriction of requests for cultures to the central organization would limit indiscriminate distribution. The cost of the organization would be offset by charging for cultures.

ROGERS (L. A.). **An apparatus for the desiccation of cultures.**—*J. Bact.*, 57, 2, pp. 137–140, 2 diags., 1949.

Details are given of the construction and use of an apparatus for the desiccation of cultures [*R.A.M.*, 28, p. 274] based on the exposure of the culture to a high vacuum with a desiccating agent to absorb water evaporated from the culture. In the apparatus described solid carbon dioxide dissolved in alcohol is used as the dehydrating agent and adjustable seals and rubber connexions are dispensed with, as far as possible. To ensure rapid and complete desiccation the apparatus must be so constructed that a very high vacuum can be maintained, and the vapour tension should be so low that moisture passes rapidly from the culture to the dehydrant.

Résumé des travaux publiés par les stations de pathologie végétale de 1939 à 1946. [A résumé of the works published by the plant pathological stations from 1939 to 1946.]—*Ann. Épiphyt.*, N.S., 13, pp. 193–218, 1947.

In this interesting and useful compendium brief abstracts are given of the papers on plant diseases published by the different plant pathological stations in France from 1939 to 1946, inclusive. Almost all the work dealt with has already been noticed in this *Review*.

PORTER (R. H.). **Recent developments in seed technology.**—*Bot. Rev.*, 15, 4, pp. 221–282; 5, pp. 283–344, 1949.

In this comprehensive review of the more important developments that have occurred in seed technology in the last ten years sections are devoted, among many others, to the recognition of the importance of seed-borne organisms in seed laboratory practice (pp. 293–302), seed-borne organisms and viruses being listed, and the use of seed fungicides in seed testing (pp. 302–315). The list of bibliographical references comprises 502 titles.

FOSTER (J. W.) & DAVIS (H.). **Detection and occurrence of acid-producing fungi.**—*Bull. Torrey bot. Cl.*, 76, 3, pp. 174–176, 1 fig., 1949.

A new selective technique for isolating acid-producing fungi is based on the colour change of brom cresol green between pH 5·4 and 3·8. The formation of organic acidity in a medium initially adjusted to pH 4 to 5 causes a marked change from blue-green or green to bright yellow. In agar plates the contrast is striking since non-acid-formers cause no yellowing. The ideal medium for this method is composed of 5 per cent. glucose (to promote maximum acid formation by the fungi), 0·5 per cent. peptone, 0·1 per cent. potassium dihydrogen phosphate, 0·05 per cent. hydrated magnesium sulphate, and 2 per cent. agar. The optimum concentration of the indicator solution (1 gm. brom cresol green ground with 14·3 ml. 0·1 N sodium hydroxide diluted to 250 ml. with distilled water) was found to be 6·7 ml. per 100 ml. agar medium, added before autoclaving. This method permits the detection of acid-formers in relatively crowded plates before overgrowth occurs, although they may represent only a small proportion of the total fungus population. The yellow acid zone is proportional in size and intensity to the acid-forming ability of the organism.

Bayley (C. H.) & Weatherburn (M[uriel] W.). **A study of the effect of leaching on the rot-proofing efficacy of copper naphthenate.**—Reprinted from *Amer. Dyest. Reptr*, 34, 7 pp., 5 figs., 2 graphs, 1945. [Received 1949.]

In soil burial tests at the National Research Laboratory, Ottawa, cotton duck, osnaburg, and sheeting treated with copper naphthenate [*R.A.M.*, 27, p. 377 and next abstract] and leached with water showed considerable breaking strength losses due to microbiological attack. Evidence indicates that this effect is not the result of loss of copper, but is associated with a change in the copper naphthenate (part of the copper being converted into a solvent-insoluble form); it does not appear to be dependent upon the pH of the water used in the leaching process. The proofing of the materials with a wax water-repellent greatly reduced this effect, while the presence of asphalt made no material difference.

Bayley (C. H.) & Weatherburn (Muriel W.). **The rotproofing efficacy of mixtures of metallic naphthenates.**—*Canad. J. Res.*, Sect. F, 25, pp. 209–220, 3 pl., 1947.

Soil burial and weathering tests of the rot-proofing efficacy of phenyl mercury naphthenate and mercury naphthenate [*R.A.M.*, 26, p. 253] mixed with either copper or zinc naphthenate [see preceding abstract] indicated that the addition of the latter compounds reduced the breaking strength losses of cotton duck during soil burial tests to an insignificantly low level, a copper treated sample containing 0·05 per cent. mercury showing the best resistance. The presence of the mercury compounds reduced the loss of copper and did not affect the weathering properties of the treated fabrics.

The growth ratings of microbiological attack for samples treated with single naphthenates and subjected to soil burial for two weeks with preliminary leaching showed that copper and mercury (0·2 per cent. metal) conferred marked resistance to the microbiological attack; cadmium gave moderate resistance. Mercury was most effective, the fabric showing no growth when the naphthenate was mixed with those of cadmium or copper, and only slight growth in admixture with silver, zinc, lead, chromium, or iron naphthenates in decreasing order of efficiency. Samples treated with the single compounds and buried for four weeks developed heavy microbial growth. The most effective treatment was the mercury-copper mixture, while mixtures of silver with copper or cadmium or zinc were moderately effective.

Ternary mixtures of the naphthenates, of which mercury–cadmium–copper, mercury–cadmium–lead, mercury–cadmium–silver, and mercury–copper–zinc allowed no growth, were on the whole more effective than the binary mixtures.

Bayley (C. H.) & Weatherburn (M[uriel] W.) **Observations on the growth of some copper-tolerant fungi on Cotton fabrics.**—Reprinted from *Amer. Dyest. Reptr*, 34, 2 pp., 1945. [Received 1949.]

This information has already been noticed from another source [*R.A.M.*, 24, p. 380].

Texera (D. A.). **Producción de sustáncias antibióticas por hongos del género Fusarium.** [Production of antibiotic substances by fungi of the genus *Fusarium*.]—*Rev. Med. vet. Parasit. Carácas*, 7, 1–4, pp. 65–144, 1948.

This comprehensive tabulated survey and discussion of the writer's experiments in the production of antibiotic substances by *Fusarium* spp., with special reference to *F. hyperoxysporum* [*F. oxysporum* f.2] from sweet potato [*R.A.M.*, 27, p. 176], is preceded by a review of previous studies on antibiosis and followed by a bibliography of 66 titles. The two substances extracted from cultures of the pathogen on

Czapek-Dox and other media are provisionally designated fusanina A and fusanina B. The former is secreted in the presence of zinc, principally by the mycelium, and exerted a powerful bacteriostatic and bactericidal action on the Gram-positive organisms tested and little or none on the Gram-negative ones.

Melin (E.) & Mikola (P.). **Effect of some amino acids on the growth of Cenococcum graniforme.**—*Physiol. Plant.*, 1, pp. 109–112, 1948.

In an experiment to determine the effect of eight amino acids, added in quantities corresponding to 0·15 gm. nitrogen per l., on the development of the mycorrhizal fungus *Cenococcum graniforme* [*C. geophilum*: *R.A.M.*, 28, p. 300] in a liquid synthetic medium at 25° C., at least six provided sufficient nitrogen for growth. However, the maximum dry weight of the mycelium after 30 days in the presence of *l*-arginine (the best of the amino acids) was only 20·7 mg., which did not equal ammonium sulphate (25·3 mg.) and casein hydrolysate (117 mg.); in the absence of any nitrogen the weight was 1·4 mg.

When nitrogen to a total of 0·3 gm. was supplied in varying proportions of ammonium tartrate and casein hydrolysate, the former compound was almost equally effective with the latter. At least three of the 14 amino acids added in 1 mg. dosages to flasks of the basal medium containing ammonium tartrate (5 gm. per l.) stimulated the growth of *C. geophilum*, the maximum increase in mycelial weight over the control (39·5 mg.) being secured in the presence of *l*-histidine hydrochloride (68·1), followed by *d*-lysine hydrochloride (57·4) and *dl*-methionine (55·7), while the values for 1 and 2 mg. casein hydrolysate were 56·8 and 66·5, respectively. It may be concluded from the experimental data that a mixture of certain acids, combined with an ammonium compound, e.g., ammonium tartrate, would constitute a valuable source of nitrogen for *C. geophilum* [cf. next abstract].

Melin (E.) & Norkrans (Birgitta). **Amino acids and the growth of Lactarius deliciosus (L.) Fr.**— *Physiol. Plant.*, 1, pp. 176–184, 2 graphs, 1948.

The mycorrhizal fungus *Lactarius deliciosus* made poor growth in a nutrient solution containing glucose, mineral salts, and ammonium tartrate (0·05 to 0·5 per cent.), supplemented with thiamine (50γ per l.), but extracts from the sporophores of certain hymenomycetes (30 mg. per flask) exerted a marked stimulatory effect, especially those of *Tricholoma personatum* and *Coprinus comatus*, which raised the dry weight of the mycelium (after 35 days) from 0·6 to an average of 24·8 and 24·6 mg., respectively [cf. *R.A.M.*, 25, p. 518]. The corresponding figures for extracts in *C. atramentarius*, *C. micaceus*, *Craterellus lutescens*, *L. necator*, and *Stropharia hornemannii* were 17·4, 14·9, 13, 13·8, and 18·9 mg., respectively. The addition to the medium of natural casein hydrolysate at a dosage of 25 mg. per flask produced about 8 mg. dry weight, while a mixture of 18 amino acids [cf. preceding abstract] in the proportions found in casein (synthetic casein hydrolysate) at 25 mg. yielded 23·8 mg., equivalent to the most beneficial of the sporophore extracts.

Bonner (J. T.). **A study of the temperature and humidity requirements of Aspergillus niger.**—*Mycologia*, 40, 6, pp. 728–738, 1 pl., 1 fig., 1 graph, 1948.

To determine the combined temperature and relative humidity requirements of *Aspergillus niger* [*R.A.M.*, 27, p. 18], small cellophane squares, previously immersed in malt extract, were streaked with the spores of the fungus and suspended on threads in stoppered bottles over solutions of different concentrations of calcium chloride, giving atmospheres of different relative humidities, and placed in an incubator.

The results showed that the optimum conditions for growth are at a relative humidity near 93 per cent. and at a temperature near 40° C.; at 100 per cent.

relative humidity the optimum temperature is near 30°. Thus the optimum condition for the growth of *A. niger* is not at saturation and the optimum temperature changes with different humidities.

HOWARD (H. W.). **Crops and plant breeding.**—*J. R. agric. Soc.*, 109, pp. 1–12, 1948.

A review is given of recent progress made in England and Wales in the breeding of better crops, particular attention being devoted to potatoes.

VASUDEVA (R. S.) & GUPTA (D.). **Foliar necrosis in Potato variety Phulwa.**—*Indian J. agric. Sci.*, 16, 5, pp. 469–470, 1 pl., 1947. [Received April, 1949.]

During the winters of 1941 to 1942 and 1945 to 1946 Phulwa potatoes propagated from apparently healthy stocks and growing in an insect-proof house at the Imperial Agricultural Research Institute, New Delhi, exhibited foliar necrosis soon after planting.

A faint mottle appeared first, developing later into necrotic spots of various sizes. These were usually very numerous on the leaves of the lower half of the plant, the top being sometimes entirely free. They occurred far apart or close together, in the latter case coalescing later to form larger spots. The spots were encircled by a faint ring of pale tissue and penetrated the thickness of the leaf; later the surrounding tissue dried up and turned brown. In severe cases the whole leaflet died soon after emerging. Juice inoculations caused the first symptoms to appear on the leaves of White Burley and German Samsun tobacco, chilli, and President and Epicure potatoes at times ranging from 6 to 15 days after inoculation. A President potato plant to which a diseased scion had been grafted exhibited foliar necrosis after about a week. The symptoms obtained on the differential host indicated that the causal virus was *Solanum* virus 6 [a strain of potato virus X: *R.A.M.*, 27, p. 91].

RIEDL (W. A.) & FROSHEISER (F. I.). **The effect of leaf roll on the yield of Bliss Triumph Potatoes.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 3, 6, p. 41, 1948.

Leaf roll was prevalent in Bliss Triumph, one of the parent varieties used in a tuber-set inheritance trial of potatoes, during the 1947 season. The affected hills were staked and at harvesting the data relating to them were kept separate from those of the healthy ones.

The total number of hills harvested was 553, of which 192 showed leaf roll symptoms during the growing seasons. The diseased hills produced an average of 4·15 tubers, compared with 8·59 from the healthy, representing a reduction of 51·7 per cent. The average weights of the largest tubers from the healthy and diseased hills were 8·42 and 3·90 oz., respectively, a reduction of 53·7 per cent. The healthy hills yielded an average of 39·95 oz. of all tubers over 1 in. in diameter and the diseased 9·77 oz., a reduction of 71·2 per cent.

LIMASSET (P.) & DE MONTGREMIER (H[ÉLÈNE] A.). **La microméthode sérologique pour l'étude des viroses végétales.** [The serological micromethod for studying plant virus diseases.]—*Ann. Épiphyt.*, N.S., 13, pp. 173–185, 5 figs., 1947. [Received April, 1949.]

In this review of the available information concerning the serological micromethod for the study of plant viruses, the application of this method to the diagnosis of tobacco mosaic virus and potato viruses A, X, and Y [cf. *R.A.M.*, 27, p. 149] is described. The authors consider that the method may be of service not only to research but also in the selection of healthy plants. By the use of sufficiently concentrated serums and the judicious choice of the time of diagnosis, the detection of plants infected with virus Y is facilitated.

Stapp (C.) & Marcus (O.). **Über das Verhalten von Antiseren der Kartoffel-X-Viren gegen bakterielle Zersetzung.** [On the reaction of antisera of the Potato X-viruses to bacterial disorganization.]—*Phytopath. Z.*, 15, 1, pp. 39–46, 2 graphs, 1948.

Potato X-virus antisera [see next abstracts] clouded by spontaneous bacterial infection proved after purification by centrifuging to be still entirely applicable for the sero-micro-reaction, indicating that the antibodies contained in these sera were not disorganized by the invading bacteria. Tests were therefore made to determine whether such typical protein-splitting organisms as *Pseudomonas fluorescens liquefaciens* [*P. fluorescens*], *P. f. non-liquefaciens* [*P. non-liquefaciens*], *P. pyocyanea* [*P. aeruginosa*], and *Bacillus mycoides* would be equally ineffectual in this respect if intentionally added, either singly or in combination, to the X-antiserum, with or without preliminary treatment by admixture with equal parts of healthy tobacco juice, standing overnight, and centrifuging off the precipitate next day [*R.A.M.*, 23, p. 496].

From 4th October, 1944, to 4th April, 1945, the sera were maintained at 3° to 5°, 23°, 30°, and 37° C. and tested weekly for loss of activity. After an unavoidable interruption the experiments were resumed on 4th September, 1945, and continued until 21st March, 1946. Only the non-pre-treated serum infected with *P. aeruginosa* held at 30° had already largely lost its efficacy by 27th December, 1944, and was totally inactivated by 18th January, 1945. Between 24th February and 15th March all the non-pre-treated sera held at 37°, as well as the uninoculated controls, had lost their precipitating properties. In the pre-treated series at the same temperature this stage was not reached until 15th to 21st March, while the preparations of both series held at 23° were still active on 16th January, 1946, but not on 21st March. The sera maintained at 3° to 5° were still almost or quite as active at the close of the experiment, i.e., after about 1½ years, as at the beginning.

These results show that the antibodies (globulins) contained in potato X-virus sera are not only more resistant than ordinary serum protein to direct proteolytic disorganization, but offer a more or less considerable degree of resistance to typical protein-splitting bacteria.

Stapp (C.) & Bercks (R.). **Über weitere Antrocknungsversuche mit Seren gegen Kartoffelviren.** [On further desiccation experiments with sera against Potato viruses.]—*Phytopath. Z.*, 15, 1, pp. 47–53, 1948.

The methods previously reported for the desiccation of potato viruses on paper [*R.A.M.*, 25, p. 356] have been improved. In experiments with different kinds of paper, using the sera at various concentrations, with and without the admixture of sugar, the following results were obtained. Dried rabbit sera reacted at least as well as liquid sera. At appropriate concentrations (0·1 to 0·3 c.c. per 12 sq. cm.) their activity was fully maintained for the duration of the experiments (1¼ to 1½ years). The intensity of the reaction was enhanced by the addition of 3 per cent. sugar, preferably in the form of lactose. Thin cartridge paper was found to be better adapted to the end in view than the coarser and firmer copying or office paper. The serum dried on paper proved superior to the liquid for the detection of the X [cf. preceding and next abstracts] and Y viruses in potato foliage, since the former gave rise to only a small proportion of unspecific and consequently inapplicable reactions.

Bercks (R.). **Serologische Beiträge zur Frage der Abwehr von Zweitinfektionen bei X-Viren.** [Serological contributions to the question of the defence against secondary infections by the X-viruses.]—*Phytopath. Z.*, 15, 1, pp. 54–61, 1948.

The development of potato virus X [see preceding abstracts] symptoms on tobacco plants is largely dependent on the age of the leaves, only the young foliage

being susceptible at high temperatures. This also applies to the primary symptoms of Köhler's strain Cs 35 of the X^N group [*R.A.M.*, 18, p. 543]. A clear-cut parallel between symptoms on the one hand and serological reaction on the other was present in the author's experiments only in young growing foliage, in which the signs of infection spread from the tip over the entire leaf.

In Samsun tobacco plants inoculated on 30th May, 1947, with a virus of the X^E group (Bs) [ibid., 19, p. 113] and three weeks later with Cs 35, as well as in those infected by the reverse process, the second virus could be serologically demonstrated in every case. In a repetition of the experiment, begun on 15th July, only the virus first inoculated could be demonstrated, presumably because the plants in this series, which had developed more rapidly than those of the foregoing, were physiologically older and in the meantime had elaborated a substance impeding the activity of the virus. In a third test, initiated on 5th September, the super-inoculated virus (Cs 35) could be demonstrated exclusively in plants inoculated for the second time within 18 days of the first operation with Bs, and not when the period of delay was shorter or longer.

These results show that opinions founded solely on the observations of symptoms as to the protection conferred by a given virus against reinfection by another nearly related one require revision, since the external manifestations of infection do not necessarily give a clue to the virus content of the plant.

FEUERBACH (P.). **Kartoffelverluste durch Fäulnis.** [Potato losses from decay.]—*Pflanzenschutz*, 1, 3, pp. 29–32, 2 figs., 1948.

The principal causes of loss among stored potatoes in Bavaria are blight (*Phytophthora infestans*), dry rot (*Fusarium* spp.), and black leg. Of primary importance in the control of these pathogens is the adjustment of the temperature in the cellar or warehouse to between 2° and 6° C. Adequate ventilation must be provided and contact with stone or cement floors avoided by the use of a lattice-work grating.

MÜLLER (K. O.) & BEHR (L.). **'Mechanism' of Phytophthora—resistance of Potatoes.**—*Nature, Lond.*, 163, 4143, pp. 498–499, 1949.

The German potato varieties resistant to *Phytophthora infestans* include, in addition to those already noticed [*R.A.M.*, 21, p. 262; 26, p. 351], ten new registrations.

Experimental evidence indicates that the alleles present in the *W* varieties [ibid., 10, p. 53] induce only a genetic predisposition of the tissues to 'acquire' local immunity when they come into contact with the hyphae of certain parabiontic races of the fungus, that is, those which kill the cells rapidly. In both susceptible and resistant genotypes the host cell is destroyed after coming into contact with the parasite, but with varying rapidity. While the cells of the former live for six to 14 days (at 19 to 21° C.), those of the latter die after one or two days, too rapidly to enable fructification and further hyphal penetration of the fungus. In the course of this rapid reaction, the tissue loses its ability to serve as a host.

It was demonstrated that the 'highly susceptibles' (the parasite penetrates uniformly through the entire tuber and fructifies abundantly) and 'highly resistants' (the parasite penetrates only a few cell-layers of the parenchyma of the tuber and then ceases to grow without fructifying) are connected by at least two genotypically conditioned intermediate types, with an intermediate reaction-rate. The results of other investigations indicated that the 'defence necrosis' is induced by substances secreted by the parasite into the host tissue [ibid., 19, p. 491]. Thus, the specific behaviour of the resistant genotypes would depend on a specific sensitivity of the protoplasm, controlled by gene *R* (which only accelerates a reaction that the susceptible genotypes can also produce), so that the highest reaction rate would be

associated with the greatest degree of resistance. As not only *P. infestans*, but also other micro-organisms cannot exist in the necrotic, transformed tissue, it is concluded that the necrosis must be accompanied by the formation or activation of a principle ('phytoalexin') which retards the penetration of the parasite. Accordingly, necrosis would depend more on the relation between the hyphal growth-rate (*Cp*) and the rapidity with which the principle forms (*Cw*) than on the absolute reaction rate. Hence with increasing *Cp* : *Cw* values the resistance would decrease and *vice versa*.

The tubers of resistant and susceptible genotypes were treated prior to inoculation with methyl, ethyl, propyl, butyl, *iso*propyl, and *iso*butyl alcohol-water solutions at concentrations which did not check the development of the fungus. The results showed that the treatments prolonged considerably the life of the cells which came into contact with the parabiontic strain of *P. infestans*, and markedly increased its subsequent development, thick aerial mycelium with sporangia developing in many cases even in the highly resistant types. A comparison of the effects of the four normal alcohols revealed a close correlation between the length of the carbon chains and their effect in reducing resistance. Tests with chloroform (as vapour) gave similar results. It is concluded that the action of narcotics on the 'resistance mechanism' is an effect connected with the primarily unspecific changes in the physico-chemical structure of the host cell, its respiratory metabolism being affected first.

NAVARRETE (M. A.). **Un program para el mejoramiento de la Papa en Colombia.** [A programme for the improvement of the Potato in Colombia.]—*Rev. Fac. Agron. Medellín*, 8, 32, pp. 375–394, 1948.

Projects for the improvement of Colombian potato stocks include the establishment of a system of seed certification to arrest the spread of virus diseases; experiments in seed treatment against *Corticium solani*, and in the use of chemical fertilizers to increase yields; and a long-term programme for the development of resistance to blight (*Phytophthora infestans*), involving crosses between the immune *Solanum demissum* as the female parent and the indigenous varieties Tocana Colorado, Tocana Blanca, Velena Colorado, Velena Rosada, Negra Ceja Blanca, and Margarita as the male progenitors. Blight is responsible for heavy annual losses, and all the commercial varieties are susceptible with the exception of Quincha, which is slightly resistant. *C. solani* and *Spongospora subterranea*, hitherto deemed to be of minor importance, are now held responsible for heavy crop reductions.

Ontsmetting van Pootaardappelen tegen Rhizoctonia. [Disinfection of seed Potatoes against *Rhizoctonia*.]—*Vlugbl.* (*Vlugschr.*) *pl.-ziekt. Dienst Wageningen* 41, 4 pp., 1 fig., 1948.

The following fungicides may be used for the control of *Corticium solani* on seed potatoes in Holland: aardisan, aretan [*R.A.M.*, 18, p. 545], atiran, tubavit, and tubosan, allowing 50 l. solution per kg. seed. If the tubers are immersed for 20 to 30 minutes the preparation should be used at a strength of 1·5 gm. in 1,000 c.c. The same liquid may be used three times running, or six times if it is supplemented after the treatment of each lot of tubers by 4 l. of double strength fungicide (i.e., 3 gm. in 1,000 c.c.) per 100 l. of the disinfectant solution. With five minutes' immersion in a 0·3 per cent. solution the liquid may be used 15 times in succession, provided it is supplemented after each treatment with 4 l. of 0·6 per cent. fungicide per 100 l. After only one minute's immersion in a 0·5 per cent. solution the liquid may be used for 20 consecutive treatments if supplemented after each with 4 l. of 1 per cent. disinfectant per 100 l.

Lansade (M.) & Anselme (C.). **Essais de traitement du Rhizoctone brun de la Pomme de terre.** [Trials for the control of the brown *Rhizoctonia* of Potato.]—*C. R. Acad. Agric. Fr.*, 35, 2, pp. 82–84, 1949.

Treatment of potato tubers at Versailles in 1948 against *Corticium solani* [cf. *R.A.M.*, 18, p. 372; 25, p. 469; 27, pp. 37, 152] with copper sulphate, copper oxychloride (wet and dry), commercial formalin, lime-sulphur, various organo-mercury derivatives (wet and dry), pentachloronitrobenzene (dry), and trichlorodinitrobenzene (dry) are stated to have given promising results in the case of 0·5 per cent. formalin and one of the organo-mercury derivatives (used wet), but to have indicated that dust treatments are not likely to prove satisfactory [cf. ibid., 26, pp. 288, 508.]

Lane (G. H.), Kunkel (R.), & Kreutzer (W. A.). **Tests of cutting knife disinfectants and cutting techniques in the control of ring rot of Potatoes.**—*Amer. Potato J.*, 25, 12, pp. 446–454, 1948.

The results of tests at the Colorado Agricultural Experiment Station in 1945, 1946, and 1947 with the double-edged stationary knife disinfected with 0·2 per cent. mercuric chloride [*R.A.M.*, 26, p. 211] indicated that the addition of a wetting agent probably gives a more effective control of ring rot (*Corynebacterium sepedonicum*). Satisfactory protection of the rotary blade was obtained with 5,000 p.p.m. chlorine with or without a wetting agent (triton X300), 0·2 per cent. mercuric chloride with or without the wetting agent, or boiling water.

Potato seed pieces cut with knives disinfected with mercuric chloride or boiling water and then placed in contact with a contaminated table surface [loc. cit.] produced excessive numbers of infected plants. Prompt immersion of seed pieces in 0·2 per cent. mercuric chloride or 2,000 p.p.m. chlorine solutions after inoculation with a contaminated cutting knife considerably reduced the number of infected plants, although ring rot resulting from both treatments greatly exceeded that from uncut tuber lots.

Starr (G. H.) & Riedl (W. A.). **A comparison of Corynebacterium sepedonicum inocula from resistant and susceptible Potato varieties.**—*Amer. Potato J.*, 25, 12, pp. 432–437, 1948.

This is the full account of the inoculation experiments conducted in Wyoming, an abstract of which has already been noticed [*R.A.M.*, 27, p. 492].

The results in 1946 showed that Teton tubers inoculated with ooze from infected Bliss Triumph and Teton developed 17 and 20 per cent. ring rot, respectively. Bliss Triumph, inoculated with ooze from resistant and susceptible seedlings, developed 91 and 97 per cent. infection; resistant seedlings inoculated with ooze from resistant tubers and susceptible seedlings developed 21 and 15 per cent., respectively.

In 1947, Red McClure, Burbank, and Bliss Triumph when inoculated with ooze from susceptible varieties showed 54, 93, and 100 per cent. ring rot, and with that from resistant varieties and seedlings 40, 65, and 100 per cent., respectively.

Ring rot symptoms developed much earlier in Bliss Triumph than in the other varieties. They were slight to absent in Teton.

Michaelson (Merle E.). **Cultural studies of Actinomyces scabies (Thaxt.) Güss.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 3, 6, pp. 37–38, 1948.

In cultural studies of the potato scab organism (*Actinomyces scabies*) [*R.A.M.*, 24, p. 113], neither vitamins nor coloured light appeared to have any effect on colony size or rate of sectoring.